Electrical World

A Review of Current Progress in Electricity
and Its Practical Applications

Volume LXXVII

Jan. 1 to June 25, 1921

McGRAW-HILL COMPANY, INC.
Tenth Avenue and Thirty-sixth Street
NEW YORK CITY

Engineering
Library

More than 25,000 Copies per Week

JAN 6 1921

Electrical World

McGraw-Hill Company, Inc. New York, January 1, 1921 Twenty-five Cents a Copy

In a half-century of continuous production,

KERITE

has spun out a record for reliability and economy that is unequalled in the history of insulated wires and cables.

Unvarying Efficiency

Weston
Model 311

Portable Potential Transformers

have been designed to obtain the high degree of accuracy that is possessed by Weston Portable Indicating Instruments assuring an accurate working combination suitable for precision measurements.

Model 311 Transformer is made for a secondary voltage of 150 volts with proportionate primary voltage in three combinations of two ranges each. The ranges are readily changed by means of links located on the insulated top of the transformer.

These transformers have an accuracy better than ½ of 1 per cent for loads not exceeding 15 volt-amperes at any power factor.

The containing case is of polished hard-wood having a removable cover. Each Transformer is equipped with a carrying-strap.

Bulletin 2001 contains complete information: write for it.

Weston Electrical Instrument Company
13 Weston Ave., Newark, N. J.

Branches in the Principal Cities throughout the World

New York
Chicago
Philadelphia
Boston
Cleveland
Detroit
St. Louis
San Francisco
Denver
Cincinnati
Pittsburgh
Richmond

Model 311
Portable Potential Transformer

Buffalo
Minneapolis
New Orleans
Jacksonville
Seattle
Toronto
Montreal
Halifax
Winnipeg
Vancouver
Calgary, Alta.

INDEX TO VOLUME LXXVII

January—June, 1921

GENERAL INDEX

Entries from the Digest of Current Electrical Literature are indicated by D (Digest)

Pages by Weeks

January	1	1 to	72
January	8	73 to	128
January	15	129 to	184
January	22	185 to	240
January	29	241 to	296
February	5	297 to	352
February	12	353 to	408
February	19	409 to	464
February	26	465 to	520
March	5	521 to	576
March	12	577 to	632
March	19	633 to	688
March	26	689 to	748
April	2	749 to	804
April	9	805 to	860
April	16	861 to	916
April	23	917 to	972
April	30	973 to	1024
May	7	1025 to	1084
May	14	1085 to	1140
May	21	1141 to	1197
May	28	1198 to	1278
June	4	1279 to	1346
June	11	1347 to	1404
June	18	1405 to	1462
June	25	1463 to	1520

A

Acceptances, banks and customers still need light on, 120.
Accident prevention:
——Fires, cause of (comment), 354.
——Fires, time to be more specific, 299.
——Need for information on treatment of electrical burns and shock. By J. M. Buswell, 1104.
——Loose methods condemned, 284.
——Resuscitation from shock by prone-pressure method, 652.
Accounting:
——Uniform system of accounts for electrical corporations ready, 1126.
Accumulators, energy in connection with hydraulic plants. By Della Riccia (D), 610.
Addinsell, H. M., *906.
Air, electric properties of, 1142.
——Electric strength of. By J. B. Whitehead and F. W. Lee (D), 1382.
Alaskan development board, secretary Wallace opposes proposed, 1182.
Albuquerque, (N. M.) Gas & Electric Company, profitable increase in business, 1002.
Aldred, J. E., lectures at Johns Hopkins, 170.
Alloys, nickel-iron. By D. Hansom and Hilda E. Hanson (D), 108.
Alternating-current circuits, graphical calculations of. By A. S. McAllister, *1359.
Alternating-current machines:
——Heat losses in. By Welder V. Lyon (D), 1381.
Alternator:
——Grounded coil, locating. By C. R. Shuck, 263.
——Temperature limits. By G. A. Juhlin (D), 610.
——Use of 220-volt for delivering 110-volt energy. By W. E. Tatem, *378.
——Vector diagram for salient-pole. B. E. B. Shand (D), 610.
——Water-wheel driven, construction. By E. Mattman (D), 272.
American Association of Engineers, activities for engineers indorsed by, 1330.
——Public information conference, 335.
——Public opinion conference, 561.
——Super-power transmission survey for northwest, 109.
American Association of Operating Engineers formed, 899.
American electrical practice (comment), 410.
American Electrochemical Society forms division on electrothermics, 1014.
——Plans electrodeposition division, 1506.
American Engineering Council urges Harding to appoint engineers, 555.
——Co-operation, international, arranged, 1501.
American Engineering Standards Committee:
——Foundation laid, 840.
——Needs government help, 805.
——Rating of electrical machinery, 840.
——Sponsors designated for electrical work, 1500.
American Federation of Engineering Societies urges elimination of waste, 844.
American Institute of Consulting Engineers, 110.
American Institute of Electrical Engineers:
——Convention midwinter, 111, 336, 443, 477.
——Frequency problem and Colfax Station topics at Pittsburgh meeting, 956.
——Has 12,301 members, 1067.
——Marine Committee issues revised recommendations, 784.
——McClellan, William, receives nomination for presidency, 668.
——Need for original papers, 846.
——New England Geographic Division, A. C. Bedford praises open conduct of electrical utilities, 616.
——Presidency, candidates for, *447.
——Pacific Coast section convention, Salt Lake City, *1469, 1501.
——Standards submitted for approval, 1502.
——Utah Section, 731.
American Iron & Steel Electrical Engineers:
——Committees, 898.
——Frequency problems and Colfax station topics at Pittsburgh meeting, 956.
American mission to London to greet English engineers, 954.
American Society of Mechanical Engineers, meeting, 1331.
——Power test codes, 844.
American-Swedish electrical commission in Switzerland, 880.
American Telephone & Telegraph stock goes on 9 per cent dividend basis, 784.
Andree, J. W., 1393.
Andrews, Thomas H. S., 1017.
Apartment, electric, servantless, 779.
Appliances, newspaper warns against home repairing, 834.
Arc generator as an engineering mechanism (D), 106.
Argentina, electric service in. By H. L. Geissel, 425.
Arkansas Light & Power Company start 33,000-volt line, 1446.
Arkansas Utilities Association consider education of customers and efficient combustion, 1121.
Arkansas utilities urged to back national advertising, 1180.
Arizona votes funds to aid Colorado River Commission, 668.
Ashworth, Paul P., *1393.
Ashworth, J. J., *1130.
Associated Manufacturers of Electrical Supplies, meeting, 330, 669.
——New London, Conn., June 27, 1177.
——Outlet-box section extends scope, 1512.
——Radio appliance section added, 1180.
Atmosphere at high levels, electrical phenomena. By S. Chapman (D), 108.
Atlanta Electric Association, 958.
Atlanta:
——Engineers advocate law to regulate practice, 445.
Australia:
——Steam station, 125,000 kw., 415.
Austria: Power possibilities. By J. Seidener and A. Gruenhut, 310.
Auto-starter easily inspected, *706.
Auto-transformers. By R. Kornfield (D), 1174.
Averill, F. M., *230.

B

Baker, E. E., 1452.
Baking, commercial, by wire, *1494.
Balancing coil, two transformers used in place of, 97.
Baldwin, F. S., 230, 1509.
Ball, H. L., 286, 510.
Ballard, R. H., 737.
Baltimore utilities arrange for interchange of service, 282.
Baltimore coal-handling method. By M. D. Engle, *133. Comment, 132.
Barker, Alexander C., *905.
Barstow properties, big gains in new services reported by, 958.
Barstow, William Slocum, *300.
Bartram, Stuart, 850.
Bassett, M. S., 174.
Batteries, storage:
——Cell tester for taking voltage readings with one hand. By Fred A. Reibert, *1322.
——Charging (D), 1382.
——Charging, booster saves energy in, 265.
——Charging for industrial trucks and tractors. By Charles A. Rohr (D), 1062.
Batteries, storage (Continued):
——Charging, simple improvement in truck-battery charging saves $36 a year. By Clarence Auty, *1053.
——Edison cells, revolving box for prolonging life of. By Fred A. Reibert, *1169.
——Edison, filling quickly. By Fred A. Reibert, *1489.
——Edison, treating. By Fred Reibert, *1432.
——Filler indicates when proper level is reached. By A. Sheinaus, *774.
——How to open a storage-battery cell. By James H. Henderson, *1257.
——Jars, breaking avoided. By Martin Melia, *714.
——Instantaneous current and voltage values in a battery. By G. W. Vinal and C. L. Snyder (D), 1261.
——Leak, very small, locating. By James H. Henderson, 1375.
——New high-capacity storage battery. By C. W. Hazelett (D), 1118.
——Preventing burn-out of still used for storage-battery water. By A. Sheinaus, *944.
——Routing through repair shop. B. H. C. Heidrich, *831.
——Scrap value of old batteries. By Martin Melia, *888.
——Sizes, calculating, for locomotives. By J. H. Tracy, *1417; Comment, 1409.
——Tank for watering batteries made from old jar. By A. Scheinaus, 1109.
——Trouble, locating with high-rate discharge test. By Ralph W. Ritter, 998.
Banash, J. L., 1017.
Baum, Frank G., Interview, *445.
Baum, William, 229.
Bavarian water powers. By Henry L. Geissel 1164.
Beaver River project, Telluride Company wants more time to complete, 788.
Becsey, A., 849.
Beeuwkes, Renier, 1186.
Behrend, Bernard Arthur, *864, *905.
Bell, Alexander Graham Dr., *906.
Bell, Louis, 76.
Bell, L. A., 1509.
Bell Telephone Company interview by B. E. Sunny, 560.
Benn, Ernest J. P., English publisher of industrial periodicals here to study labor, 1066.
Berlin factories on energy rations, 114.
——Power supply of. By E. Ruhle (D), 1174.
Bibber, T. H., 286.
Bibbins, James Rowland, 1393.
Billing, bimonthly, Portland Company adopted:
——Direct by meter readers cuts cost. By J. R. Robinson, 1251.
——Mail collection of consumers' bills in scattered territory. By B. W. Little, 1253. Comment, 1209.
——Specific bill form makes coal clause understandable, *1058.
Billings prize, 1389.
Blake, H. W., celebrates thirty years as Electric Railway Journal editor, 129, 167.
Blanton, G. J., 565, 850.
Blessing, Edgar, 1451.
Blondin, Joseph T., *906.
Blooming mill:
——Controller, automatic, operates blooming-mill lift tables successfully. By D. W. Blakeslee, *377.
——Electric drive replaces steam. By B. M. Jones, *715.
Blower breakdowns, improvised forced lubrication prevents. By C. F. Ralston, 319.
Boiler room:
——Cast-iron headers unsatisfactory for forcing boilers, 712.
——Chimney losses, kinds and relation importance. By Olof Rodhe, *544.
——Combustible gases and CO_2 records, *654.
——Condenser tubes, sand-blasting. By F. C. Ralston, 95.
——CO_2 and combustible gases should be watched. By Olof Rodhe, 712.
——CO_2 percentage not final test of good combustion. By Olof Rodhe, 429.
——Feedwater pumps, maintenance. By John M. May, 543.
——Fireman, a good. By A. B. Clark, 826.
——How a boiler room can improve quality of service. By C. A. Greenidge, 994.
——Instruments and records for boiler and engine rooms. By C. A. Greenidge 938.
——Instruments indispensable for boiler room economy. By Roy Page, *1234.
——Reducing losses. By C. A. Greenidge, 599.
——Rules to be followed while working around boilers and stokers. By H. J. Burton, 940.
——Salt concentration, too low, is not economical. By R. J. C. Wood, 262.
——Steam leakage through 0.0001-sq.in. hole wastes $40 per year. By H. F. Eddy, 47.

*Indicates illustrated articles

397196

Boiler room (Continued):
——Unusual boiler-tube corrosion by carbon dioxide. By Barzillai G. Worth (D), 1327.
Boilers:
——Blast-furnace gas. Cockerill (D), 273.
——Capacity limited by fuel conditions. By Joseph Harrington (D), 723.
——Electrically heated (D), 553.
——Electrically heated. By P. Bergeson (D), 1381.
——Electrically heated steam boilers. By Revel System (D), 1327.
——Electrically-operated steam, performance of 370.
——Inspecting and cleaning. By John M. May, 318.
——Practice in Great Britain. B. M. R. Habershow (D), 328.
——Redesigned Stirling boilers to have fewer classes. *934.
Bonus yields 6000 meter readings per man per month, 270.
Book reviews, 499, 725, 1119.
Boss, E. H., 174.
Boston:
——Better illumination exposition, 1505.
——Chamber of Commerce opposes St. Lawrence project, 560.
——Edison Electric Illuminating Co., commercial and operating convention, 502.
Courtesy, organizing, to build good will. *1157.
Establishes suburban district managerships, 661.
Engineers, hydraulic and steam relay topics presented to, 450.
Rates, extensive inquiry expected, 1502.
Bragg, R. B., 962.
Brarand, R. J., 1393.
Brazier, E. E., 1187.
British Columbia, electrical development necessary to progress, 948.
British Columbia requires registration of engineers, 337.
Brody, H. A., *621.
Brooklyn:
—Consumer and employee on utility directorate, *381.
Brooklyn Edison Company revenue, 504.
Brown, C. L., 738.
Brown, Frederic D., 1509.
Brown, G. C., 118.
Brown, Hugh A., 286.
Brown, M. W., 1452.
Brundige, Harley W., 1336.
Brushes, proper fit and correct pressure help
Buffalo General Electric Company's customers increased 900 per cent in past decade, 777.
Bulgaria, water power and irrigation (D), 1174.
Bump, Milan Raynard, *1280.
Bunn, Jacob, 564.
Bureau of Standards, electrical work may be divided, 1443.
Burns, a ready dressing for, 938.
Burton, Frank V., 738.
Busbar bender which does quick and effective work. By R. H. N. Lockyer, 1112.
Business:
——American business man voices an opinion (comment), 1405.
——Electrical, in 1920. By T. Commerford Martin, 304.
——Federal Reserve Board sees turn for better in general, 392.
——Gradual improvement predicted by A. W. Douglas, 1388.
——Government help for, 973.
——Improvement here and will grow, says A. W. Douglas, 506.
——Municipal borrowing, further signs of improvement in, 342.
——Research and labor outstanding problems, says Nichols, 1447.
——Two underlying features for better conditions, 1511.
Business, central-station:
——Customers' orders, handling. By Charles A. Collier, *437.
——Smaller volume of new business brings increased revenue per kilowatt-hour, 663.
Business depression, worst effects from, are over, says A. W. Douglas, 279.
Bus supports well designed to withstand short circuits, *373.
Butler, H. W., *905.
commutation. By A. L. Heath, 1111.
Bylesby Engineering & Management Corporation customer ownership, 110.
Bylesby, H. M. & Co.:
——Properties co-operate in "National Thrift Week," *383.

C

Cables:
——Aerial, for power distribution. By F. A. Westbrook, *1411; Comment, 1409.
——Bending large cable to fit close quarters. By Herbert G. Stoddard, 268.
——Failure of lead sheathing of telegraph cables. By L. Archbutt (D), 1261.
——Heating of buried cables (D), 664.
——Increasing rating. By W. A. Del Mar, 33.
——Insulation, higher temperatures in, *413.
——"Leader" cable at Portsmouth. By J. J. Bennett (D), 951.
——Rating, increasing (comment), 355.
——Sealing in Motor terminal box. By R. L. Kirk, *1490.
——Submarine power cables (D), 138.
——Underground, economic aspects of extra-high distribution. By R. O. Kapp (D), *328.
Cables (Continued):
——Voltages, increasing maximum working (comment), 411.
——Voltage, maximum allowable. By Charles W. Davis and Donald N. Simons (D), *329.
——Waterproof anchorage for roof cables. By A. H. Magnuson, 660.
Cadle, Charles L., 230.
Caldwell, Richard E., 1394.
Caldwell, William R., 1394.
California:
——Electrical Safety Code. By R. L. Eltringham, 317.
——Electrical safety laws to be extended, 330.
——Growth a lesson to other states (comment), 467.
——Electrical co-operative campaign, 1266.
——Industrial Accident Commission, 1385.
——Railroad Commission, 170, 844.
——Railroad Commission, more changes, 1122.
Canada shows rapid hydro development. By J. B. Challis, *931.
Canadian Electric Association faces situation confidently, 1442.
——Officers elected, 1502.
Canal and power projects, combining in Germany, 75.
Canfield, G. H., *905.
Carey, P. T., 286.
Car lighting by electricity. By Charles W. T. Stuart (D), 722.
Catenary construction, renewal in Hoosac Tunnel. By L. C. Winship (D), 837.
Catlin, Hoyt, 1510.
Central Maine Power Company:
——Acquires more properties, 226.
——Serves 12,000 square miles, 765.
——Team play gets more than 98 per cent collections, 720.
Central station output (see Statistics).
Ceperley, T. H., 118.
Chemistry of Switzerland. By Dr. A. Landoll (D), 554.
Chicago (see also Commonwealth Edison Co.):
——Electrical code changes, 1390.
Chicago home rule, 57.
——Electric ordinance opposed by Power Club, 1443.
——Licensing ordinance redrafted, 1333.
——Licensing ordinance widely opposed, 1385.
Chicago pageant of progress, 842.
Chicago, Milwaukee & St. Paul Railway electrification and elevation (D), 161.
Chilean Exploration Company plants at Tocopilla and Chuquicamata. By M. Neustatter (D), 892.
China:
——Shanghai electrical development. By I. V. Robinson (D), 440.
Choke coil, space saved and troubles reduced by design of choke coil. By C. C. Robinson, *1052.
——Self-inductance, graphic computations. By J. Hak (D), 498.
——Strain type. By A. V. Arero, *261.
Chromium-tungsten-steel, methods of magnetic analysis (D), 1007.
Cincinnati Gas & Electric Company:
——Creates permanent financial structure, 109.
——Installs more generating capacity, 1067.
Circuit breakers:
——High speed. By C. G. Grissinger (D), 893.
——Magnetic blow-out forces in. By A. C. Bartlett (D), 554.
——Oil, selection. By W. H. Wallau, *252. Comment, 242.
——Record size for Great Western Power Company, 282.
Cities Service stock, script dividends bring crash in, 1502.
City may proceed under public utilities law instead of under franchise provisions in acquiring plant, 1016.
Clamp eliminates soldering on splices. By W. H. Williams, *488.
Clarkson, S. N., *622.
Cleary, Alfred J., 737.
Cleaves, Benjamin F., 677.
Clifford, James J., 738.
Clingerman, B. H., 621.
Coal:
——Bituminous, no shortage anticipated, 1448.
——By products and high-voltage protection, 246.
——Calder bill, hearing to be continued, 393.
——Combustion residue, reclaiming by-products from. By H. O. Herzog, *486.
——Electric utilities' coal stocks in good shape, 1063.
——Fuel clause standby established by Montpelier Co., 57.
——German utilities, group buying of coal suggested for, 58.
——Handling in power house. By George Frederick Zimmer (D), 611.
——Industry Senator Calder introduces bill to regulate, 166.
——Kentucky utilities hit by higher coal freight, 1180.
——Powdered coal and briquets. By R. Dawson Hall (D), 664.
——Powdered-coal firing for electric power stations. By Friedrich Munzinger (D), 892.
——Prices, heavy decline, 56.
Coal, pulverized. By Lawford H. Fry (D), 107.
Coal pulverized:
——Protecting against explosions and fires, 1381.
——Saving in the chemical industry. By David Brownlie (D), 107.
——Smith, Dr. George Otis urges ample coal reserves for utilities, 1330.
——Stocks, utilities asked to report, 840.
——Storage at the mines to prevent shortage, *882.
——Storage to prevent fire. By W. D. Langtry (D), 53.
Coal pulverized (Continued):
——Storing up a year of power. By W. L. Abbott (D), 1260.
——Colfax station of Duquesne Light Company, *865 (Comment 862). *753 (Comment 751).
Collier, Charles A., *792.
"Collier's" asks a square deal for public utilities, 661.
Colt, J. S., 962.
Commission abandonment, retiring Illinois governor against, 110.
Commission rulings (see also Contracts, Court decisions and Legislation).
——Breakdown service to competitor, 396.
——Competition, approval of, 563.
——Competition, permission for, 284.
——Estimating overcharges due to defective meter, 172.
——Defense of the service charge, 172.
——Departments of utility must be considered separately, 61.
——Disputed bill for past services not sufficient reason for refusal to serve, 172.
——Free service illegal, 339.
——Inefficient operation, 228.
——Line extensions in New York, 1268.
——Service abandonment authorized, 339, 508.
——Service connections, utility not justified in asking customer to finance, 55.
——Service, duty to render, 61.
——Service, 24-hour, compelled, 339.
——What constitutes reasonable extensions, 172.
Commissions:
——Arkansas, home-rule control revived, 561.
——California, power commission proposed for, 1008.
——California's proposed hydro-electric commission, 973.
——Colorado River commission now gathering data, 1068.
——Colorado River commission plans, 1029.
——Colorado River Development Commissioners, 1264.
——Colorado River development, commission to secure action on, 277.
——Connecticut, may extend scope of, 505.
——Home rule, more to abolish, in Michigan, 277.
——How can fit commissioners be retained? 129.
——Illinois committee on public utility information, 1003.
——Indiana public service commission, 172.
——Montana Commission holds that tide has turned, 1016.
——New Jersey again has utility commission, 731.
——New Jersey case, 960.
——New Jersey governor's removal of, upheld, 443.
——New Jersey has new public service board, 672.
——New Jersey ousted, 56.
——New York goes back to single commission, 952.
——New York Water-Power Commission organized, 1500.
——North Dakota, 284.
——North Dakota, illegal commission procedure, 1128.
——Rights of courts and commission in Michigan, 1268.
——Treatment of utilities, more liberal, advocated, 1390.
Commonwealth Edison Company:
——Calumet station, *1419; Comment, 1408.
——Description of properties, Front of May 28 issue.
——Electric-vehicle show, 727.
——Employees to be represented, 164.
——Financial statement, 560.
——Industrial relations department, duties of, 214.
——Salesmen's compensation, 1494.
——Switch house, new type, prevents bus short circuits. By B. G. Jamieson, *761. Comment, 750.
Compensators:
——Careful inspection. By H. S. Rich, 1168.
——Ceiling mounting for large. By H. L. Burns, *435.
——Mounting on ceiling. By H. L. Burns, *604.
Competition, wasteful, 845.
Compressors, air, vibrating from two, eliminated by balancing. By L. C. Beaty, 212.
Compressor, motor-drive, small space. By Eugene Carpenter, *432.
Communities are judged by their utilities, 1002.
Comstock, Louis Kossuth, *468.
Condensers, electrostatic. By V. E. Goodwin (D), 54.
Condenser, size and type required for small plants. By A. B. Clark, 1052.
Condenser, steam, modern. By E. R. Briggs (D), 1498.
Conduit, terminal, neat and economical. By Thomas Naf, *1432.
Condon, E. J., Jr., *1451.
Conduit, underground, accident hazards in laying, 97.
Conference Club:
——Discusses financing of labor board, 897.
Connant, Wallace B., 850.
Conrad, Frank, *285.
Consolidated Gas & Electric Company:
——Advertising, *608
——Coal-handling method. By M. D. Engle, *133. Comment, 132.
——New power business expanding, 1064.
Consumers' Power Company starts service on new 140,000-volt line, 954.
Contracts:
——Abrogation of special contracts in Utah, 790.
——"Adequate consideration" in Utah case, 735.

*Indicates illustrated articles

Contracts (Continued):
——Between municipality and utility. 1185.
——Breaking of rate contracts with municipalities justified. 1003.
——Coal, uniform, proposed. 900.
——Corporations cannot pick and customers. 790.
——Courts' duty in protecting from confiscation 735.
——Final rulings of California Commission in Redding case. 736.
——Implied obligations. 1335.
——Los Angeles-Southern California Edison, sustained. 1450.
——Massachusetts Committee opposes interlocking contractural relations. 732.
——Property of utility devoted to public use cannot be condemned under general authority. 790.
——Reciprocal duties of government and owners of franchise. 1392.
——Right of eminent domain granted to Indiana utilities. 1263.
——Supreme court upholds Utah commission in special case, 555.
——Texas city ordinance not a contract. 1392.
——Utah supreme court denies rehearing in special contract case. 1120.
——Utility leased to private company by municipality. 1508.
——Validity of franchise contracts. 1268.
——Wholesale company allowed to do retail business. 1392.
——Wisconsin constitutional provision wrongly applied to contract with electric company. 903.
Contractor-Dealers' Association in new quarters, 957.
Contractors' cost of installation to be studied, 275.
Contractors' licensing risk, need for uniformity, 1067.
Control, motor:
——Additional switch saves contacts of starter. By M. J. Rich, *1493.
——Compensator, automatic mounted on lathe. By Alex H. May, *208.
——Neat starter brackets of strap iron or pipe. By R. S. Rich, *1324.
——Preventing motor burnout caused by low-voltage trip sticking. By Robert Hamilton, 549.
——Slip regulator, liquid. By Guy F. Scott. (D), 274.
——Starting switch, emergency, for slip-ring motor. *1169.
Conversion apparatus for Edison systems. By T. F. Barton & T. T. Hambleton. (D) 1117.
Converter, rotary:
——Applications for the small rotary converter. By L. Vadot, (D), 1260.
——Commutator brushes for. By R. H. Newton (D), 553.
——Large. By P. Hartig (D), 216 and 664.
——Voltage regulation. By F. T. Haynes (D), 610.
Co-operative campaign in California, 56.
Co-operative work, perseverance in (comment), 1408.
Cooper, H. W., 962.
Copper (see Trade, domestic).
Copper, domestic production in 1920, 121.
Copper-nickel alloys. By Paul D. Merica. (D), 1007.
Corddy, W. H. 173.
Corrosion:
——Due to ground current. By Zaugger (D), 273.
——Metals and alloys. (D), 1328.
——Iron and steel. By T. S. Fuller (D), 1382.
——Iron and Steel. By F. N. Speller (D), 1499.
Cost, installation, job order records check. By A. G. Humphrey, *829.
Cost of living, electricity cutting, 52.
——Figures on, 337.
Costs, engineering. By Frank Walker (D), *1383.
Costs, recent equipment, in Massachusetts central stations, 47.
Costs, operating, of small, medium and super-power plants. By Henry Flood, Jr., *1232.
Costs, utility and newspaper, compared, 51.
Cotton gin shows energy consumption of 16.5 kw.-hr. per bale. *324.
Cotton spinning mills. By L. Miller (D), 611.
Coupling, flexible. By Walter B. Atchinson, *435.
Court decisions:
——Admissible evidence in suit for damages, 676.
——Admissions of one co-defendant company in damage suit no defense, 1185.
——Alleged benefit to land from overflow of dam not to be considered in damage suit, 1071.
——Attempt to cut fallen electric wires where no emergency existed act of intermeddler, 848.
——Change from hydraulic to hydro-electric power leads to suit, 960.
——Circumstances under which diverted water may be returned to old channel, 563.
——City may sue for benefit of its inhabitants, 1268.
——Climbing decayed pole not necessarily negligent, 228.
——Colorado federal court insists that public does not own utilities, 1123.
——Commissions findings sustained where arbitrary action is not shown, 960.
——Company not liable for death of boy who climbed tower, 1268.
——Condemning property beyond state limit, 1496.
Court decisions (Continued):
——Conflicting interests of transmissions and telephone companies, 563.
——Contact between its wires and those of light company, 1185.
——Contributory negligence, 735.
——Contributory negligence for court when facts are undisputed, 1268.
——Corporations may practice engineering if licensed engineers are engaged, 953.
——Dam, breaking of, 61.
——Damages recovered because of fright caused by meter reader entering without knocking, 848.
——Damages, when court may hold excessive, 1128.
——Death due to mental strain not accidental, 563.
——Definition of "Police Power." 1185.
——Distributing company cannot shift responsibility for poor service to selling company, 848.
——Duty to trespassing child, 1335.
——Employer liable for defective insulation, 1120.
——Franchise surrender, 339.
——Guy wire, injury from, 284.
——"High Degree of Care" and "Ordinary Care." 1185.
——Horse frightened by electric shock, 284.
——Industrial commission cannot fix compensasotion for injury without regard to testimony, 960.
——Injury arising out of employment, 790.
——Injury to consumer for shock, 676.
——Instructions on duty of maintaining safe conditions, 563.
——Iron wire not necessarily proof of imprudent construction, 172.
——Liability for death from wires charged to present theft, 1128.
——Liability of company for death by drowning, 1335.
——Low wires across street, 1450.
——Maintenance of power plant below street level not negligence, 117.
——Manager and part owner of small utility may receive compensation for injury received while doing manual work, 1185.
——Neglect to guard high-tension wire, 1185.
——No writ of review granted where commissions finding is justified by evidence, 563.
——Oklahoma corporations commission restrained, 848.
——Only condition under which commission's findings of fact may be set aside, 1016.
——Orders for spot fuel cannot be filled while contract deliveries are not made, 172.
——Ordinance requiring free municipal service void, 1071.
——Period of repose, filing of schedule, 848.
——Permitting recovery of exemplary damages without evidence of wantoness is prejudicial error, 563.
——Plaintiff in discrimination case has burden of proof, 563.
——Possibility of shock from fallen wire question for Jury, 960.
——Prevention of competition, 790.
——Profit during depression, 1392.
——Protection from confiscation, 960.
——"Proximate" cause, definition, 228.
——Refusal of service not justified in "saturated" community, 848.
——Regulation, power of, involves obligation to protect, 103.
——Remedies before commission must be exhausted prior to appeal to courts, 1335.
——Responsibility for unprotected transmission wires, 620.
——Right to condemn water-power site, Tacoma upheld in, 225.
——Right to use of land for water flowage not lost by "adverse user." 1071.
——Rules of evidence in commission proceedings, 676.
——State vs. Federal control, 284.
——United States Supreme Court has no concern with delegated powers of state, 563.
Crane, G. S., 850.
Crane, J. B., 509, 1452.
Crane, magnetic plate-handling, (D), 1062.
Crane-motor control by Bergmann system. By E. Blau. (D), 893.
Crane, shield for protecting drop cable of crane magnet. By Herbert J. Wolf, 1259.
——Spot lamp for. By R. S. Lowry, *1471.
Crawford, Karl B., 1393.
Crawford, T. F., 850.
Crecelius, Lawrence P., 1018.
Curtis, E. 621.
Curtiss, George W., 1336.
Cushing, Ira, 1509.
Customer ownership:
——Byllesby Engineering & Management Corporation, 110.
——Committee in New England, 1064.
——Desirable power customer, 1325.
——Exceeds $100,000,000, 88. Comment, 129.
——Fractional shares recommended, 327.
——How customer ownership influences public good will, 720.
——Industrial plants, self-interest in utility financing (comment), 185.
——Interesting the lowly in investments. By Henry L. Doherty, 73.
——Iowa Railway & Light Co. ninety per cent of employees are stockholders, 105.
——Nearly 8,000 shares sold to 938 persons in 10 days, 503.
——Of meters not approved, 1128.
——Public ownership of securities will offset agitation, 633.
——Public opinion, and (Comment) 409.
Customer ownership (Continued):
——Puget Sound Power & Light Company insures wide distribution of note issue, 158.
——Sale of preferred stock at par, *607.
——San Antonio (Tex.) Public Service Company, 609.
——San Francisco electrical development league sells stock, 58.
——Stock ownership, unexpected letter from employee, 1172.
——Thrift campaigns and self-interest (Comment), 185.
——Value of customer ownership, 1254.
——Wide ownership of industries will end labor unrest, says Doherty, 166.
Customer relations, financing and appliance sales are Kansas men's topics, 957.
Cutting castings by electric-arc process, *545.

D

Dallas Electric Club working to build the southwest, 786.
Dame, Frank L., *1017.
Dams:
——Concrete joints, 814.
——Economical use of flashboard supports on a curved dam. By C. I. Hosmer, 1051.
Daniels, R. S., 1129, 1393.
Darrow, W. A., 622.
Davidson, H. M., 1452.
Daylight lamp increases production of St. Louis factory, 891.
Daylight saving:
——Again before New York legislature, 110.
——Muddle (comment), 521.
——No hope for national, 1263.
——Situation not uniform in the east, 667.
Deffenbaugh, H. C., 285.
Delaware station of Philadelphia Electric Company, *1145. Comment, 1142.
Depreciation, amortization, obsolescence and similar topics. By Kassandra, 103.
Detroit:
——Edison Company's 1920 earnings did not keep pace with demand, 392.
——Edison Company revenue, how it was spent, 1438.
——Edison Company will offer stock to local investors, 391.
Development, arrested, of public utilities. By Edward N. Hurley, *1037. Comment, 1030.
Devlin, Frank R., *622.
Diesel engines chosen for 2,500-kva. standby plant, 883.
Diesel-engine industry. By L. H. Morrison (D), 949.
Diesel engines used as standby to hydro plants in Europe, 95.
Direction finders, errors. By Dr. E. Bellini (D), 839.
Directory, illuminated, for central-station office, 1116.
Dispatching, wireless to aid, in Southern interconnection, 900.
Distributing power in southern Sweden. By Halden (D), 107.
Distribution:
——Arresters, cost of compared with cost of transformer burn-outs, 150.
——Arresters needed on low-tension bus of power customers. By S. A. Fletcher, 713.
——Cable ducts lowered without service interruption. By S. B. Hood, *542.
——Card records for distribution poles. By Theodore H. Rice, *939.
——Connecting overhead circuits to underground cables. By A. A. Meyer, *1151.
——Corner, double-pole, for heavy conductors, *1487.
——Corner poles placed so they do not obstruct sidewalk, *996.
——Cost of energy fundamental in design of distribution systems, *703. By P. O. Reyneau and H. P. Seelye, Comment, 690.
——Cost of 2300-volt extensions, *600.
——Cross-arms, value of treating is questioned, 655.
——Curves help management. By G. S. Hardy, *1167.
——Curves showing men employed and labor cost aid management. By George M. Hardy, *996.
——Economics of. By P. O. Reyneau* and H. P. Seelye, 79 and 146. Comment, 73 and 131.
——Economy of impregnating wooden poles. By F. Moll (D), 1327.
——Effect of high costs on. By E. B. Meyer, 25.
——Electricity. By W. B. Woodhouse (D), 385.
——Fishing cable with compressed air. By N. B. Hinson, 1167.
——Fuse block, sectionalizing. By R. A. Hammock, *95.
——Grounding deserves serious attention, *318.
——Grounding low-voltage secondaries. By J. Larkin, 1105.
——Grounds, transformer, measuring the resistance of. By Arthur H. Ford, *1106.
——Ground wire should have low resistance and reactance. By Theodore H. Rice, 883.
——Line corners, better, *429.
——Losses which may be eliminated, 654. By Theodore H. Rice.*
——Manhole, temperature of cables reduced by blower in. By W. E. Richards, *487.
——Map easy to revise. By Theodore H. Rice, *826.
——Notching poles, value of, before treatment with preservative. By Page Golsan, 1108.

*Indicates illustrated articles

Distribution (Continued):
——Periodic inspection of services. By Theodore H. Rice, 1166.
——Phase rotation, testing for, in three-phase circuits. By F. A. Kartak, *928.
——Pole stubbing, cheap and effective. By R. A. Hammock, *711.
——Preservative for wooden poles. By Nowotny (D), 722.
——Pushing a large cable through a long duct. By William Hemphill, 1167.
——Rapid determination of current. By S. Austen Stigant (D), 107.
——Rating and reliability of apparatus is increasing. By M. M. Samuels, 23.
——Scheme to determine whether secondaries are overloaded, *542.
——Secondary, economic study of. By P. O. Reyneau and H. P. Seelye (D), 272.
——Secondary networks, numerous advantages. By T. H. Rice, 769.
——Short circuits in large systems. By A. Dalla Verde (D), 553.
——Substantial alley construction for heavy leads, 1256.
——Systems need more expert attention. By S. B. Hood, *1244.
——Tracing the unaccounted-for losses. By G. T. Bogard, 1248.
——Transformers, estimating peak load on distribution transformers. By Paul P. Ashworth, 1108.
——Trouble, graphic reports aid in removing. By George M. Hardy, *828.
——Uniform service and meter wiring. By L. C. Peterman, *359; Comment, 355.
——Use of several conductors in one conduit reduces current capacity. By Henry C. Horstmann and Victor H. Tousley, *1099.
——Voltage drop on alternatng circuits, calculating. By Charles E. Warsaw, 263.
——Voltages in Switzerland. By A. Grunhut, *643.
——Methods compared. By Fred Morgan, *245, comment, 242.
Distribution, industrial:
——Branch circuits, three-phase panel box for. By L. A. Blackburn, *211.
——Bus, heavy supporting. By E. L. Bragdon, *1435.
——Plug, rugged attachment. By H. S. Rich, *658.
——Portable rack for supporting outdoor motor circuits. By D. W. Yambert, *941.
——Power, Method of distributing. By D. E. Hayner, *1489.
——Reactors reduce current unbalance. By R. H. N. Lockyer, *433.
——System for concrete factory. By C. P. Trueax (D), 780.
——Wire sizes for lines feeding induction motors. By Frank G. Perley, 1258.
District commissioners senate confirms President's nominations, 672.
Dixon, James, 1336.
Doble, Robert M., 1451.
Dodge Charles R., 962.
Doherty prize, 1389.
Dow, Alex., 1336.
Downing, Paul M., *119.
Draper, C. L., *792.
Drills, electric, operating and maintaining portable. By E. L. Connell, 1109.
Drills, obtaining good performance. By E. L. Connell, 1001.
Duquesne Light Company, Colfax station, *865, comment, 862.
Dyment, A. E., 1017.

E

Economy, search should not be curtailed (comment), 409.
Edgar, Charles L., 57.
Edison, Thomas Alva, at thirty years, *371.
Edison medal, M. I. Pupin, 55, 500.
Edison Pioneers hold annual gathering at inventor's home, 388.
Edison's test of education, 1141.
Education:
——College standing and engineering success, ratio between, 640.
——"Engineering English" should mean good English, 974.
——French and American colleges to exchange technical professors, 1125.
——Meter lecture and slide available for meter departments, 787.
——Metermen's school success, Wisconsin, 392.
——Metermen, university extension course for, 58.
——Meter readers school, New York company conducts, 160.
——Public utility good will through public schools and libraries, 1116.
——Scholarship and eminence in engineering. By Raymond Walters (D), 1383.
——Students, electrical engineering increase, 141; Comment, 485.
——Worcester Polytechnic Institute, new electrical course, 1445.
Edwards, E. P. *1017.
Einstein, Albert, 841.
Eissler, R. F., 174.
Electrical industry will require $10,371,000,000 by 1925, *5.
Electrical Manufacturers' Council to take up freight classification, 782.
Electrical Safety Conference, 732.
——Standards, work continued on, 1501.
Electrical Supply Jobbers' Association, 727, 1270.
——Atlantic Division, 670.
——Convention at Hot Springs, 1389, 1453.
Electric Power Club:
——Opposes Chicago ordinance, 1443.
Electric Power Club (Continued):
——Temperatures, switches, buses and bare conductors, 49.
"Electric Week" in Hanover (D), 665.
Electrification plans in Italy, 674.
Electrodeposition of metals. By W. E. Hughes (D), 839.
Electrolysis mitigation in Winnipeg. By W. Nelson Smith (D), 892.
Electromagnetic theory is fundamental. By A. E. Kennelly, 29.
Electron theory of the metallic state. By G. Borelius (D), 108.
Electron tubes, applications are increasing, 560.
Electron tubes soon in heavy power service, Dr. Hull predicts, 1263.
Electrophysics:
——Apparent irreversibility of the calomel electrode. By A. W. Laubengayer (D), 1062.
——Determining fundamental and harmonics of alternating current. By L. Lombardi (D), 554.
——Distortion in thermionic tube circuits (D), 951.
——Harmonic analysis of complex waves. By Frederick S. Dellenbaugh, Jr. (D), 724.
——Maxwell's equations significance. By F. D. Murnaghan (D), 723.
——Negative ions in air. By Leonard B. Loeb (D), 893.
——Piezo-electric and allied phenomena in rochelle salt. By J. Valasek (D), 1328.
——Thermionic current between parallel plane electrodes. By Thornton C. Fry (D), 1261.
——Variable electrical systems. By John R. Carson (D), 893.
Eltringham, R. L., *62.
Empire State Gas & Electric Association:
——Production and distribution problems discussed, 444.
Employee relations:
——Practical method of rating central station employees. By J. E. Shute, *946.
——Wages, lower, brought by lower living costs, 219.
Enameling in the automobile industry. By M. R. Armstrong (D), 217.
Enameling oven, electric heat raises output. By James W. Carpenter, *873.
Engineering Council gives an account of its stewardship, 788.
Engineering Societies building, purpose of, 936.
Engineering Society Service Council duties transferred to Federated American Engineering Societies.
Engineers should travel more (comment), 917.
Engines, internal-combustion. By C. S. Darling (D), 949.
England:
——Telephone, long-distance system of the United Kingdom. By Sir William Noble (D), 1175.
English interest finish 100,000-hp., high-head plant in Spain, 1126.
English plans for power supply, 1029.
Etching, inexpensive electric pencil. By John A. Toleik, *942.
Evaporation from temperature records. By C. E. Gunsky (D), 724.
Executive-engineer-banker needed, 1141.
Expanding metal rings. R. H. N. Lockyer, *718.
Experience and study (comment), 806.

F

Fagan, F. D., *230.
Fagg, J. H., 118.
Federal Power Commission, 168.
——Accounting system for licensees tentatively drafted, 1504.
——Appropriation cut to $100,000, 111, 387.
——Colorado River, application to develop 2,500,000 hp. on, 55.
——Columbia River, $25,000,000 project on, 613.
——Deschutes river conflict, 726.
——Great Falls development, recommends Tyler plan for, 445.
——Irrigation promoters oppose power project, 1178.
——Niagara waters, prospective use of, not considered, 275.
——Personnel, delay in amendment may hold up permits, 219.
——Regulations, 727.
——Regulations, amended, approved, 1331.
——Regulations, final, expected, 443.
——Regulations ordered promulgated, 558.
——Rulings, 1447.
——Secretary of War again heads commission, 667.
——Substitute proposed, 1444.
——Water-power act, New York State opens fight on, 218.
——Water-power applications, 42, 56, 138, *369, 559, *585, 615, *815, 1265, 1415.
——Water-power applications in 1920 reach 13,000,000 hp., 138.
——Water-power depreciation, 726.
Federal Trade Commission:
——Files complaint against U. S. Steel Company, 1075.
——Tells how cost of living can be reduced, 956.
Federated American Engineering Societies 727.
——Amer. Engr. Council:
Industrial relations plan, 330.
Takes duties of Engineering Societies Service Bureau.
Wallace, L. W., elected secretary, *449.
——Waste elimination to be studied, 1503.
Feiker, F. M., to assist Hoover, 1179.
Financing:
——Alabama Power Company, 1442.
——April financing unusually high, 1064.
——Automatic financing. By R. H. Ballard, 10.
——Billions ahead for the electrical industry, 120.
——Booklet to help sale of securities, 269.
——California-Oregon to reduce capitalization, 334.
——Church funds invested in utility stock, 719.
——Cincinnati Gas & Elec. Co. creates permanent financial structure, 109.
——Common stock is basis of financing. By W. S. Barstow, 305.
——Cost of financing extensions, 1071.
——Credit, importance of utility, in relieving housing shortage, 450.
——December brings total to $316,373,000, 56.
——Detroit Edison Company issues $5,532,600 of ten-year 8 per cent bonds, 166.
——Dividends, script, bring crash in Cities Service, 1502.
——Duquesne Light Company offers $10,000,000 in debentures, 1262.
——Employee-investors build, thrift and good will. By George H. Stack, 269.
——Employees and customers oversubscribe million-dollar note issue, 946.
——February 19, $9,000,000 total of two issues week of, 444.
——Five-million dollar program for Potomac Electric Company, 728.
——Has its problems no less than engineering, 94.
——Human-interest sales appeal, *271.
——Hundred thousand people to help finance 900,000-hp. project, interview with R. H. Ballard, 842.
——Indiana company cannot dispose of 5 per cent bonds, 1505.
——Interstate Public Service Company, Indiana sells $500,000 of stock to customers, 891.
——January, more than $40,000,000, p. 331.
——Kansas non-par stock law, 617.
——Large financing by electric utilities, 1120.
——Light and power, 1385.
——Los Angeles Gas & Electric $3,500,000 issue, 1506.
——March shows higher yields, 784.
——Massachusetts stock equalization bill goes over to next year, 957.
——Massachusetts utility financing explained at Boston hearing, 672.
——May breaks all records, 1333.
——Money rate to rule for well-known companies, favorable, 386.
——Narragansett company may increase capitalization by $5,000,000, 953.
——No immediate reduction of interest rates looked for by bankers, 1125.
——Ohio public utilities to spend half billion during 1921, 1009.
——Oklahoma Gas & Electric retires underlying securities, 392.
——One-tenth of Ohio's population interested in utility securities, 1125.
——Pacific Gas & Electric Company, 891.
——Pacific Gas & Electric sells $1,374,000 stock in 24 days, 382.
——Philadelphia Electric Company to issue $5,000,000 more preferred stock, 1010.
——Portland Railway, Light & Power to float note issue through employees, 444.
——Premiums, Massachusetts companies seek right to capitalize, 501.
——Proper proportion of bonds of stock, 620.
——Puget Sound Power & Light Company issues $13,734,000 in refunding bonds, 952.
——Relation of securities to value of property, 721.
——Rural extensions, 676.
——Sale of securities. By Percy H. Whiting, 1226.
——San Joaquin Company permanent financing plan proposed, 392.
——Securities gaining in investment strength, 668.
——Securities of week reach over $12,000,000.
——Southern California Edison, 332.
——Southern California Edison issues $10,000,000 in bonds, 221.
——Southern Indiana Gas & Electric Company would increase stocks, 1505.
——Stock dividend approved by Maine Commission, 736.
——Stock dividends declared illegal, 563.
——Tendencies in utility financing. By A. N. Kemp, 985.
——"The people's project"—an address by R. H. Ballard, 777.
——Thrift pamphlet to promote sale of securities, 215.
——Totaling $17,000,000 announced, 1177.
——Utilities should educate investor. By F. D. Marsh, 1426.
——Utility securities, cost of selling, *327.
——Week's financing total $18,500,000, p. 330.
——Western companies offer $9,000,000, 667.
——Why customers should invest in utility securities, 114.
Fink, Dr. Colin G., *961.
Finland's wealth of water power, 1240.
Finlayson, Don N., *850.
Finnicum, J. L., 510.
Fires, cause of, not accurately reported. By Mathew King, 825.
——Electric, only 2.57 per cent of all. By Reginald Trautschold, *693; Comment, 690.
——Losses and electricity. By Ira H. Woolson, 709.
——Prevention in electrical stations. By H. J. Burton, 1166.

*Indicates illustrated articles

Fires (Continued):
——Underwriters' figures, Society of Electrical Development attacks, 277; Comment, 428.
Fire waste, government aid needed in study of. By Frank W. Glading, 1370.
Fisher, R. E., *1018.
Flame excitation of luminescence. By F. L. Nichols and D. T. Wilber (D), 1260.
Flatirons, electric, economy of. By R. Naujoke (D), 892.
Flood, Colorado, does slight damage to electric properties, 1384.
Floor hooks facilitate moving apparatus. By W. H. Millan, *320.
Flywheel design for reciprocating machinery connected to synchronous generators or motors. By R. E. Doherty and R. F. Franklin (D), 53.
Ford's hydro-electric plant at Troy, N. Y., 785.
Foster, F. C., 678.
Foundations for machinery. By N. W. Ackinoff (D), 274.
Fourier's series, errors involved in solving for constants of, by calculation method. By Warren Mason (D), 1007.
Fowler, E. J., *1451.
Fox, Arthur W., 1018.
France:
——Hydro plant, making best use of. By Lucien Pakir, 357, comment 355.
Franklin, Benjamin, 169.
Franklin medal, Sprague, Frank J., to receive, 1124.
Franklin, N. S., 849.
Freeman, Frank H., 1130.
Freight house operating. By W. E. Phelps (D), 723.
Freight rates; N.E.L.A. Commercial Committee men see benefits in high freight rates, 166.
——Seasonal, on lake coal, 1067.
French, Lester Gray, 1018.
French light and power plants, reconstruction, 648.
French super-radio station, 170.
Frequency changers, magnetic. By J. Zenneck (D), 162.
Frequency problem in the steel industry. By B. G. Lamme (D), 1117.
Frequency, steel-mill, problem. By B. G. Lamme, *921, comment 918.

Fuel:
——Hogged, a new source of energy for the Northwest, *1352.
——Illinois coal, boiler tests on. By Henry Kreisinger and John Blizard (D), 1498.
——Peat power plants in Germany (D), 1381.
——Pulverized fuel test figures presented before A.S.M.E., 1264.
——Where it should be conserved, 75.
——World supply. By L. P. Breckenridge (D), *441.
Furnace, electric:
——Ajax-Wyatt, motor effect in. By E. D. Northrupp (D), 329.
——Brass, operating records of. By James F. Brusster, 49.
——Brass, shows small metal loss, 1322.
——Decreasing electrode consumption, 776.
——Electrode heat losses through a six-ton Heroult furnace. By M. R. Wolfe and V. De Wysocki (D), 107.
——Electrodes, continuous, self-baking, 102.
——Electrodes, careful handling, 833.
——Electrodes, how to join, 886.
——Electrodynamic force in. By Carl Hering (D), 1382.
——Heat content of steel and slag from. By A. M. Kuhlmann and A. D. Spillman (D), 107.
——Interior, *137.
——Logs and records aid in operation, 1053.
——Melting (D), *54.
——Melting in non-ferrous industry. By Edwin F. Cone (D), 1006.
——Non-ferrous. By H. W. Gillett (D), 117
——Non-ferrous, becoming popular. By Edwin L. Crosby, 35. Comment 131.
——Operating details of electric furnaces. By Edward T. Moore (D), 780.
——Operating records, refining steel. By M. H. Schmid, *605.
——Performance of electric furnaces (D), 1062.
——Pig-iron, Swedish. By Jonas Herlenius (D), 838.
——Refractories, better, needed, 765.
——Refractories, physical characteristics of specialized. By D. E. Allen (D), 108.
——Regulation of electric steel arc furnaces using movable electrodes. By W. G. Mylius (D), 1117.
——Smelting. By F. Rowlinson (D), 723.
——Smelting of Montana manganese ores. By E. S. Bardwell (D), 665.
——Smelting of pig iron at Domnarfvet, Sweden. By Gerard De Geer (D), 1062.
——Snyder, data on operation, 880.
——Steel (D), *1411.
——Steel industry, status of electric. By Edwin F. Cone (D), 441.
——Usage fast increasing, 77.
——Versus combustion for low temperature. (D), 54.
——Working with the metallurgical engineer, 1030.
Fuses:
——And switches, inclosure growing in favor, 900.
——High-voltage. By P. Charpentier (D), 723.
——High-voltage for the protection of instrument transformers. By F. Patzelt (D), 1328.
——Improper fusing, need of, protest against. By J. C. Langdell, 1485.
Fuses (Continued):
——Refilling inclosed. By H. S. Rich, 820, comment 992.
——Refilling, is hazardous. By Dana Pierce, 992.
——Transformers, sizes to use for. By Carl A. Wegman, 486.
Fuse plugs, improper fusing of, 1030.

G

Gardner, B. H., 678.
Gardner, P. D., 229.
Garrison, N. J., 621.
Gas lighting, past, present and future. By Howard Lyon (D), 664.
Gas undertakings, electric power on. By H. C. Widlake (D), 837.
Gate-opening indicator made in station, *150. By R. S. Daniels.
General Electric Company:
——Business, 836.
——1920 billings $275,000,000, 841.
General Electrical Merchandising Conference started, *169.
Generating plant:
——Alternators good parallel operation. By James Dixon, 431.
——Auxiliaries, small turbines versus electric motors. By A. B. Clark, 939.
——Calumet station of Commonwealth Edison Company, *1419; Comment, 1408.
——Checking efficiency. By John O. Fuchs, *531.
——Diesel engines chosen for 2,500-kva. standby plant, 883.
——Diesel engines used as standby to hydro plants in Europe, 95.
——Fuel, pulverized, control, 96.
——Heat, accumulated, using. By R. Wolff (D), 1498.
——Inspection placed on scheduled basis, *1043, comment, 1031.
——Keeping a generating station in good condition. By John W. May, 1256.
——Maintenance organization for a 35,000-kva. plant. By S. B. Flagg, *713.
——Maintenance schedule. By S. B. Flagg, *827.
——Operating costs of small, medium and superpower plants. By Henry Flood, Jr., *1232.
——Operation, economical. By C. H. McClintock, *1481.
——Power-station design, 75.
——Public Service Company of Northern Illinois, new 200,000-kw. steam-electric plant for, 617.
——Purchase surplus hydro power to cut generating costs, 897.
——Relay power stations. By E. B. Powell, *637, comment, 639.
——Temperatures in power stations. By G. Kleinath (D), 1498.
——Tendencies in the design of. By Peter Junkersfeld, *5.
——Tidal-hydro-electric scheme British government's 500,000-hp., 115.
——Water study important in large steam-plant development, 59.
Generators (see also Machines, electric):
——Blowing out, removing dust from building. By R. H. N. Lockyer, *1428.
——Coils, repairing mica-insulated. By C. R. Reid, *1487.
——Dual-drive units. By Ivan Stewart Forde (D), 722.
——Economical size of generator. By A. B. Clark, 881.
——50,000-hp. wheels for 500,000-hp. plant. By E. T. J. Brandon, *697, comment, 691.
——Short-circuit current of induction motors and. By R. E. Doherty and E. T. Williamson (D), 328.
——Speed regulator for motors driving high-frequency generators. By W. Dornig (D), 781.
——Synchronous machines, data for estimating weights of. By Theo. Schou, *1160, comment, 1142.
——Synchronous, regulation. By A. G. Warren (D), 1497.
——Temperature rise with short-time loads. By R. E. Hellmund, 707.
——Voltage, making build up. By Leroy A. Francis, *1372.
Geological Survey, U. S., November daily energy figures year's highest, 336.
George, Benjamin P., *119.
Georgia electrical interests band together for mutual advantages, 1177.
Georgia electrical interests plan co-operation, 1009.
Georgia School of Technology to aid industrial development, 506.
Germany:
——Electrification of the upper Rhone district, 991.
——Great hydro-electric development planned, 20.
——Power practice (D), 106.
——Water power in (D), 216.
Gherardi, Bancroft, *692.
Gjolme A. S., 850.
Glenn, Tate G., 1186.
Goggin, Victor T., 1187.
Gooding, R. F., *791.
Goodwin, W. J., 1510.
Goodwin, W. L., joins Society for Electrical Development, *557.
Gordon, Frederick D., *62.
Government engineers' salary bill provisions, 59.
Graham, Edward M., *509.
Graphite, resistance of. By S. L. Walworth, 1371.
Gravitation, eletricity and. By H. Bateman (D), 329.
Gravitation, electromagnetic theory. By H. A. Wilson (D), 611.
Great Falls development, Washington, D. C. (see Hydroelectric developments).
Green, M. F. P., 850.
Gregory, Richard, 1452.
Greiff, Victor, 621.
Griffith, Franklin Thomas, 1088.
Grisell, T. O., 1394.
Groome, Frank T., *792.
Grounding, inductive, in sysems with unsymmetrical capacity distribution. By Jonas (D), 837.

H

Hall, J. W., 118.
Hall, William H., 1509.
Handling materials:
——Economies in industrial plants. By J. S. Tuthill, *201, comment, 187.
Hanschel, Ottomar H., 1072.
Hardeman, Isaac, 1452.
Hardin, T. M., 1452.
Harding, President, indorses electrical expositions, 840.
Harrington, W. H., 1451.
Harriman, Henry I., 173.
Harris, Richard G., 62.
Harrison, R. F., 850.
Hart, Charles B., 173.
Hartford (Conn.) Electric Light Company, new plant construction, 843.
Hartness, James, Vermont's Engineer Governor, 59.
Haskin, J. R., 1452.
Hatch, P. M., *1129.
Hazel, W. J., 510.
Headlight generators, temperature rise (D), 664.
Heat dissipation coefficients of iron and copper. By K. Lubowsky (D), 665.
Heating, electric, Thermal characteristics of electric ovens and hot plates. By Ezer Griffiths and F. H. Schofield (D), 950.
Heating, high-frequency inductive. By E. F. Northrup (D), 1328.
Heating, industrial, co-operative instruction planned, 845.
——Industrial, to improve power and load factors (comment), 299.
——Industrial, unusual developments. By Wirt S. Scott, *307.
Heating service, electric, where it is discriminatory, 228.
Heating water for barber shops, 52.
Heat treatment, electromagnetic, of carbon steel. By Lancelot W. Wild (D), 108.
——Steel, electromagnetic control of, 322.
Heavy equipment transported over steep mountain roads, 770.
Hecht, Julius L., *791.
Heckman, G. C., 119.
Heermans, Frank A., 961.
Hekma, Jacob, 509.
Helium, structure of atom. By Irving Langmuir (D), 1006.
Hell Gate station of the United Electric Light & Power Co., *140.
Hench, L. W., 850.
Heustis, Major G., 621.
High-frequency currents, effeective capacity and resistance of a condenser for (D), 162.
Highways, shall telephone and power circuits occupy the highways? (comment), 354.
Hillin, W. L., 229.
Hinson, N. B., Using conduit as return cuts cost of street lights, 206.
Hoagland, H. C., *791.
Holtzer, Charles William, 1032.
Home, electrical, in Chicago, 844.
Homes wired, 3,000. By L. J. Wilhoite, *820.
Hoover, Herbert:
——F. M. Feiker to assist, 1179.
——New sphere of service (comment), 521.
——Resigns from presidency of the engineering council, 955.
Horton Robert E., 286.
Hood, John, 738.
Hortonia company quickly rebuilding damaged station, 391.
Housing, what it means to the industry, 129.
Houston, C. E., 737.
Houston, David F., 1509.
Houston (Tex.) Lighting & Power Company proposes guaranty fund and lower rates, 1013.
Hoyles, N. C., *792.
Hunter, John, *285.
Hutchinson, A. A., 510.
Hydro-Electric Power Commission of Ontario:
——Queenston-Chippawa development. By E. T. J. Brandon, *697, comment, 691.
Hydro-electric development:
——Chippawa power development authorized by Ontario, 958.
——Colorado River project (comment), 297.
——Delaware River, 500,000-kw. development proposed, 362.
——Economics of. By A. H. Gibson (D), 1260.
——French hydro plant, making best use of. By Lucien Cahill, 357, comment, 355.
——Great Falls development. By Lansing H. Beach, 57; Senate rider to start, killed, 1442.
——Great Falls development, no serious objections to Tyler report, 393.
——Kettle Falls, to harness the Columbia at, 958.
——Motor on waterwheel-driven exciter saves shutdowns. By J. W. Andree, *771.
——Muscle Shoals work, Senate votes for continuance of, 390. See also under Muscle Shoals.)
——Niagara Falls. By John L. Harper and J. Allen Johnson, 1469.

*Indicates illustrated articles

Hydro-electric development (Continued):
——Nore Falls (D), 1061.
——Penstock, hauling up mountain roads. By R. C. Starr, *653.
——Planned for Indiana on Tippecanoe, 55.
——Western, water storage essential to, 223.
——What it means to industry, *159.
Hydro-electric plant:
——Air bound in penstock reduced output. By J. W. Andree, 711.
——Bettering efficiency of hydro-electric plants, 1320.
——California designs (D), 553.
——Eget, France. By Eydoux and Leboucher (D), 53.
——Frazil ice formation easily prevented, 785.
——Kerckhoff development, simple and compact hydro station. By R. C. Starr, *471, 641; Comment, 465.
——Low-head plant efficiencies. By H. H. White, 316.
——Queenston-Chippawa development of Hydro-Electric Power Commission of Ontario. By E. T. J. Brandon, *697, comment, 691.
——St. Lawrence, 5,000,000 hp. available, *312.
——Swiss plant under a mile head, *529.
——Unit operated from city water main. By J. B. Holdcroft (D), 1260.
——Valve, hydraulically operated. By Blake R. Vanleer, *48.
Hydro-electric station, automatic. Operating results of a 1,500-kva. automatic hydro station. By T. A. E. Belt, 1235.
Hysteresis effects with varying superposed magnetizing forces. By W. Fondiller and W. H. Martin (D), 665.

I

Ice diversion on St. Lawrence River. By Benjamin F. Groat (D), 108.
Ice storage, artificial, energy requirements for, 547.
Idaho Power Company, no new development planned, 281.
Idaho power possibilities, 1122.
Ignition system, effect of shunted resistance, or plug leakage, on sparking performance of. By G. E. Bairsto (D), *385.
Illinois commission bill, Western Society of Engineers protests against, 1332.
——Passes, 1500.
Illinois Commission chairmanship, Smith accepts, 898.
Illinois to have new commission pending legislative action, 164.
Illuminating Engineering Society:
——Committee on Progress (D), 53.
——Convention, Rochester on Sept. 26, 730.
——Offices elected, 1446.
——Should not move, 805.
——To retain part of present quarters another two months, 1064.
Illumination (see also lighting).
Illumination developments during 1920, *83.
Illumination, unsymmetrical. By Louis Bell, 652.
Images method of. By I. Jakob Kuns and P. L. Bayley (D), 665.
India, electrification of railways (D), 217.
Indiana Public Service Association meeting, 222.
Indiana:
——Super-power system for, 332.
——Utilities pay fourth of state tax, 1179.
Industrial applications:
——Electrician, pay board to locate. By A. E. Verney, *436.
——Lathes charged to individual drive, *1431.
——Localized Blower improves working conditions. By J. S. Thomas, *945.
——Pilot lamp indicates when service is off. By H. S. Rich, *380.
——Screw machine motor drive, *1375.
Industrial co-operation under government supervision urged, 787.
Industrial electrical engineers, executive duties of, 749.
Industrial load phenomenal growth, *39.
Industry, electrical:
——Fundamentally sound says Shiras Morris, *1386.
——Outstanding aspects, 1.
——Unique economic position of (comment), 1347.
Information Bureau for Texas advocated, 1178.
Information bureau planned for New York State, 617.
Inspection, assuring continuous production, 144.
Inspectors, electrical:
——Appliance fire hazards working to minimize, 443.
Inspectors, electrical, seek co-operation (comment), 411.
Inspectors, Western Association of Electrical:
——Auto-transformer hazards, recognize, 337.
Instrument leads, convenient marking for, 1374.
Insulation:
——Conductivity of insulating materials near the breakdown voltage. By J. E. Shrader (D), 1328.
——Glass, electrical properties. By J. R. Clarke (D), 1328.
——Heat conductivity of insulations used on conductors in turbo-alternators. By P. Janet (D), 1261.
——Motor service requirements. By John S. Dean, *1433.
——Research work on (D), 1440.
——Temperatures, maximum, allowable, 154. Correction, 490.
Insulators:
——Curve-drawing thermometers to study insulator failures. By S. R. Van Drezer, 1050.
——German standards (D), 497.
——High-tension, new cement for. By Weicker (D), 1175.
——Life, records show. By S. R. Van Drezer, *1429.
——On 45,000-volt system. By H. B. Vincent (D), 272.
——Pins, design of. By Donath (D), 273.
——Progress during 1920. By Harris J. Ryan, *31.
——Records of defective, 601.
——Sliding base prevents breakage. By R. H. N. Lockyer, *601.
——Standard, may be used on 220,000-volt lines, says Mark G. Baum, *445.
——Suspension, new. By G. Gastennova Tedescol (D), 498.
——Suspension type (D), 664.
——250,000-volt, fireworks on, *197.
Insull, Martin, voices necessity of publicity, 391.
Insull, Samuel. Opposite page 1207, 1269.
Insurance, employees prefer, to turkeys for Christmas, 51.
Insurance policies, utilities should scrutinize terms of, 159.
Insurance policy barring electrical plant employees, 620.
Interconnection:
——Benefits even small plants, 16.
——Bethlehem Steel Company interchanges power with Lehigh Valley Co., 843.
——Central station and isolated plant, 11.
——Economic benefits derived from energy interchange, *1239.
——Improvement by liberal co-operation. By A. T. Throop, 202.
——International continental line closely follows American practice, 975.
——Isolated plant and central station, economic value questionable. By H. P. Seelye, 824.
——Limitations. By E. C. Stone, 990.
——Load curves show advantages, *439.
——Power-contract principles. By R. S. Hale, 4.
——Small plants. By Harry J. Burton, 1239.
——Southeastern, last obstacle removed, 280.
——Will fail unless all interests work together, 729.
Interference, inductive:
——Assessment of cost of remedial measures, 904.
——Auxiliary transformer reduces. By L. J. Moore, *257.
——D. I. Cone, 825.
——Effect of static discharge on telephone, telegraph and power circuits. By Charles T. Reisz, 993.
——Misuse of engineering data for legal purposes, 634.
——Problems, friendly solution pledged, 782.
——Telephone interference rules withdrawn after misuse, 613.
——Telephone noises reduced by double overhead ground wire. By R. H. N. Lockyer, *544.
Inter-Scandinavian power exchange planned, 846.
Ionization and resonance potentials of some non-metallic elements. By F. L. Mohler and Paul D. Foote (D), 54.
Iowa utility court bill, contractors blamed for veto of, 1008.
Irby, Stuart C., 1394.
Irrigation, dense irrigation load in California. By Edward N. D'Oyly, *1241.
Italian Commission here to study railway and industrial electrification, 1011.
Italy:
——Electrical industries' growth. By Henry L. Geissel, 428.
——Hydro-electric construction in Italy. By Lyman George Stucke, 1048.

J

Jacobs, Gaskell S., 962.
Jacobs, S., 1017.
James, H. D., 962.
Janison, E. S., 678.
Japan, regulations governing development of water power in Japan, *1101.
Jenison, Edward S., 174.
Jennings, R. M., 565.
Jewett, Dr. F. B., *961.
Jobber's, business conditions, 14.
——Preparing for "normalcy", 1349.
Johnson, Carl E., *1451.
Johnston, Robert, 962.
Jollyman, J. P., *285.
Jones, George S., 119.
"Journal of Electricity" enlarges its scope, 331.
Joy, W. W., *906.
Joyce, Major Harry B., 1451.

K

Kahn, Jacob A., *1394.
Kansas City electrical show, 1011, 1069.
Kansas Court of Industrial Relations, utilities commission divorced from, 500.
Kelley, W. G., 737.
Kelly, D. H., 859.
Kendall, E. W., 230.
Kennelly, Dr. A. E., *356, 1336.
Kennedy, C. S., 621.
Kennedy, S. M., *791.
Kentucky utilities hit by higher coal freight, 1180.
Kerckhoff development, simple and compact hydro station. By R. C. Starr, *471, *641; Comment, 465.
Kester, John T., 509.
Kiernan, John, 565.
Kilkenny, H. W., *906.
Kimball, G. E., *510.
King, H. R., *118.
Kirkgasser, George J., 565.
Klees, P. S., 174.
Knight, Arthur S., *564.
Knopf, Herbert, 621.
Koch, O. H., 1187.
Koiner, C. W., 1393.
Kuster, J. D., *1509.

L

Labor:
——Electricians' strike follows wage reduction, 389.
——Cost, manufacturers', *13.
Lamps:
——Bowl-enameled. By Ward Harrison (D), 272.
——Cooper-Hewitt quartz lamp and ultra-violet light. By L. J. Buttolph (D), 53.
——Edison, manufacture of. By Henry Schroeder (D), 328.
——Floor, pleasing proportions. By J. R. Cravath (D), 216.
——Mounting which withstands high temperature. By H. S. Rich, *997.
——Renewals, free, Boston company curtails list of, 1496.
——Signal, flashing speeds. By A. G. Worthington (D), 6101.
——Stereopticon service. By H. F. Barnes (D), 328.
Layng, John F., 1018.
Leach, F. A., Jr., *173.
Leadership more essential now than ever before, 862.
Leakage, current, detected by receiver connected to metal shoes. By H. O. Herzog, 996.
Learned, Ernest F., 1451.
Leber, Charles W., 174.
Lee, N. A., 1072.
Lee, William States, *1129.
Legislation, (See also court decisions and commission rulings):
——Bill providing commission regulation for Delaware defeated, 782.
——Boy climbing transmission tower, 1450.
——Boy injured by inadequately safe-guarded wives in lot used as playground entitled to damages, 452.
——British Electricity Supply Act, 709.
——California legislature subpoenas public utility heads, 673.
——Coal-control bill, Calder, is securing consideration, 280.
——Compulsory customer financing in New York, 674.
——Condemnation, right of, sustained, 508.
——Confiscation, protection from, 452.
——Congress, electrical industry benefits but slightly from acts of last, 667.
——Contributory negligence, not, to fail to see low overhead wire, 452.
——Discontinuance of service, 452.
——Election favoring municipal acquirement of electric plant sustained, validity of, 396.
——Engineering Council appeals for support of pending patent legislation, 1125.
——Federal Employee Measure, 731.
——Franchise Tax Law, Possibility of Repeal, 170.
——High voltage need not be proved if death results, 452.
——Illinois commission bill before legislature, 1123.
——Illinois utility bill passes house, 1332.
——Iowa conflict due to misunderstanding, 1063.
——Leased electric devices, bill to exempt from execution for rent, vetoed, 1505.
——Maine Governor recommends taxing water power to insure state control, 728.
——Municipal light plant bonds legalized by Indiana legislature, 1265.
——New York State water-power measure introduced, 728; passed, 1011.
——Oklahoma commission's powers upheld, 508.
——Patent amendment proposed, 1329.
——Powers of municipalities and public service commission, 396.
——Protecting wires, duty of, 1450.
——Water-power legislation urgent in New York State, 749.
——Water-power, New York State legislation, 58.
——Water power:
West Virginia, extension development hangs on, 449.
——West Virginia public service commission ordered to hear case affected by federal injunction, 396.
Leighton, M. O., *1072.
Leland Stanford Junior University where 220,000-volt transmission problems were solved, 1126.
Lewis, D. K., *791.
Lewis, Earl C., 62.
Lewis, E. I., 1072.
Lewis, E. W., *1017.
Lewis, F. B., 1336.
Lewis, Herbert T., 62.
Libby, J. H., 286.
Licenses from engineering corporations, business men oppose taking, 899.

*Indicates illustrated articles

Licensing of engineers in Missouri, 225.
Lightfoot, E. N., 850.
Lighting:
——Armories and gymnasium. By A. L. Powell and A. B. O'Day (D), 272.
——Automobile, survey of voltages in. By H. G. Magdsick and Howard Karz.
——Better illumination exposition at Boston, 1505.
——Calculations, diagrams to assist in. By C. W. Kinney, *489.
——Code, New York, to be revised, 502.
——Color, recent applications of. By Augustus D. Curtis and J. L. Stair (D), 553.
——Core room. By H. S. Rich, 884.
——Daylight lamp increases production of St. Louis factory, 891.
——Department store. By Julius Daniels (D), 497.
——Design must consider cost of cleaning fixtures. By D. W. Blakeslee, 772.
——Design, simplified. By Earl A. Anderson, *416, comment 410.
——Dusty places. By C. L. Dows, E. B. Fox and W. P. Blackwell, 191, comment 187 and 768.
——Dusty places. By T. H. Arnold, 768.
——Drafting room By E. D. Learned, *714.
——Educational campaign for better lighting, *552.
——Henri Pieron on the physiological principles underlying the study of light. By Leonard T. Troland (D), 1327.
——Industrial, behind lamp development. By S. E. Doane, *37.
——Industrial, improvement of (comment), 298.
——Industrial, safety features of. By Samuel G. Hibben (D), 1498.
——Installation, calculation of. By A. S. Turner, Jr. (D), 106.
——Local, by lamp suspended from pulley. By S. G. Hibben, *212.
——Medical, including hospitals and dental offices. By A. L. Powell and H. H. Allison (D), 384.
——Mercury vapor luminosity. By Norman H. Ricker (D), 723.
——Mountain highway, 841.
——Piers and docks. By H. E. Mahan (D), *1174.
——Poor, defective vision among school children due largely to, 1182.
——Poor, high cost of. By R. E. Simpson (D), 161.
——Powder plants and munitions houses, safe fixtures for. By Samuel G. Hibben, *268.
——Progress. By W. E. Bush (D), 722.
——Punch presses, lamp and bracket for. By John A. Toleik, *657.
——Reflector arm for safe maintenance, homemade swinging. By A. H. Magnuson, *379.
——Reflector, mounting lighting, out of way of cranes. By Samuel G. Hibben, *321.
——Safety features of industrial lighting. By Samuel G. Hibben (D), 1260.
——Sewing-machine, high intensity improves. By D. S. Myers, *1054.
——Ship. By R. W. Peden (D), 497.
——Ship's set, emergency (D), 441.
——Shoe factories, 154.
——Shoe factories. By A. L. Powell and J. H. Kurlander (D), 106.
——Support for adjustable local lighting. By S. G. Hibben, *549.
——Switchboard. By W. B. Wood, *602.
——Units, calculating size of. By D. W. Blakeslee, 600.
Lighting Fixtures:
——Adaptability of modern to classic architecture, 115.
——Detachable, reduces cleaning expense. By J. C. Ritchey, *833.
——How often should lighting fixtures be cleaned. By D. W. Blakeslee, 941.
——Indirect ceiling fixtures provide even illumination for library, *929.
——Removable (D), 780.
——Unit with pull switch mounted on shade. By I. H. Gaskin, *98.
Lighting, street:
——Big field, *1416.
——Burn-outs prevented by relay scheme. By J. H. Robertson, *995.
——Circuits checked by graphic record, *881.
——Citizens appointed custodians of lights. By W. M. Hamilton, 1060.
——Electrodes for arc lamps checked by monthly curves, *938.
——Globeless unit, *1430.
——Increased activity, 556.
——Milwaukee, *1246.
——Minneapolis, 845.
——Moonlight schedules are relics of the past, 861.
——Ornamental. By Arthur J. Sweet, *1247, comment 1208.
——Salt Lake City, contract closed for extension, 282.
——Switch effective. By D. A. McNulty, *1050.
——System neutral as return decreases cost. By S. B. Hood, 1167.
——Tower on truck makes work of painting mast arms of street lamps easier, *1319.
——Using conduit as return circuit cuts cost. By N. B. Hinson, 206.
Lightning arresters:
——Transformers, mounting close to. By R. A. Hammock, *375.
Lindsley, A. V. S., 565.
Line foreman, the job of the, 919.
Linn, Arthur J. M. Jr., 1394.
Lisberger, S. J., 119.
Little, A. M., 678, *792.
Load dispatcher:
——Authority and duties. By M. M. Roddey, 430.
——Plug board for primary-line switching control. By A. F. Jordan and W. L. Foss, *1106.
Locomotives, electric:
——Austrian Railroads (D), 53.
——Battery sizes, calculating. By J. H. Tracy, *1417; Comment, 1409.
——Economical and constructive viewpoints for large. By Alb. Laternser (D), 838.
——Gotthard railway. By A. Marshall (D), 1260. By W. Heyden (D), 1498.
——Large recent. By A. Laternser (D), 1498.
——Mi , standard practice in building storage battery, 102.
——Selecting for metal mines. By T. H. Arnold, *209.
——Signals, repetition, on locomotives. By F. Limon (D), 1118.
——Swiss progress (D), 1062.
——Vibration phenomena of electric locomotives with rod drives. By A. Wichert (D), 892.
Locomotives, storage-battery, designing. By C. W. Smith (D), 1261.
Logging equipment, electric, of Snoqualmie Company, *265.
Long, R. T., *564.
Looms, individual-gear drive for heavy. By G. F. Sills (D), 950.
Lovett, F. L., *791.
Lowe, James R., 1336.
Lubrication, spray pipes in steam line improve lubrication 601.
Luehrs, Daniel M., 286.
Lukes, George Holt, *565.
Lumber stacker decreases cost of handling lumber. By W. C. Heston, *1113.

M

Machines, direct current:
——Voltage relations in. By R. E. Ferris (D), 328.
Machines, electrical (see also Alternators, generators and motors):
——Mechanical features, desirable. By James Dixon, 376.
——Rating. By Francis B. Crocker, *977.
——Synchronous, design data for choosing. By Theo. Schou, *1033.
——Windings, high-voltage, alternating-current. By W. Zederbohm (D), 1105.
MacPherson, William T., 1269.
Magnet steel, "K. S." By Kotaro Honda and Shozo Saito (D), 274.
Magnetic behavior of iron in alternating fields of frequencies between 100,000 and 1,500,000 cycles. By Leon T. Wilson (D), 1007.
Magnetic circuit, the. By L. Champney (D), 949.
Magnetic materials, development of. By T. D. Yensen (D), 951.
Magnetic susceptibility of low order. By E. Wilson (D), 1062.
Magnetism:
——Electromagnetic field of transoceanic radiographic waves. By C. Vallauri (D), 893.
——Hall effect and Nernst effect in magnetic alloys. By Alpheus W. Smith (D), 781.
Magneto testing and the choice of a spark gap. By A. P. Young (D), 329.
Mailhouse R. J., 1393.
Main, Charles Thomas, *1464.
Maintenance handled in central shop on southern system. By George A. Iler, 1237.
Mallet, John P., 1129.
Manganin, influence of iron on the temperature coefficient of. By Dr. Juichi Obata, 993.
Manitoba water powers and the Canadian pulpwood industry, 900.
Manuel, B. S., *286.
Manufacturers co-operate to build good will for utilities, *550.
Marine railway, motor drive for, 888.
Markham, Herbert F., 1510.
Markwart, A. H., *173.
Marron, J. T., 1187.
Marshall, E. C., 1130.
Marshall, Harry E., 962.
Marshall, W. J., *962.
Martin, T. C., 737.
Maryland State Board of Electrical Examiners and Supervisors, 170.
Material-handling, brief directory of apparatus. By R. H. McLain (D), 1062.
Maxham, Howard W., *906.
Maxwell, Robert D., 62.
Mayo, Herbert J., *906.
McClellan, William, 509:
——Elected president of A.I.E.E., 1262.
——Receives nomination for A.I.E.E. presidency, 668.
McGill, T. Julian, 1509.
McKay, Charles W., 678.
McKinley, William B., 1187.
McNeil, William, 173.
McQuarrie, J. L., 286.
McRae, Roderic 1072.
Meadowcroft, William H., *1510.
Measurements (see also Meters):
——Casting temperatures in brass foundry (comment), 354.
——Condenser losses measured with electrometer. By M. Thielers (D), 1007.
——Currents, very heavy, multiple-unit shunts for. By M. B. Field (D), 162.
Measurements (see also Meters) (Continued):
——Instruments and measurements, paper. By F. V. Magalhaes, 1472.
——Low-voltage measurement, shop method. By V. M. Arana, *997.
——Power, at low power factor. By Cotton (D), 1499.
——Power factor, by a double instrument. By W. Fuhrmann (D), 1007.
——Power factor, measuring with reactive-component meter, *1491.
——Resistance units, multohm. By Lilienfeld and Hofmann (D), 54.
——Sphere-gap, 807.
——Standard cell, new form. By C. J. Rodman and T. Spooner (D), 611.
——Stop watch as a precision instrument. By A. L. Ellis (D), 724.
——Stroboscopic method of slip measurement. By C. Breitfeld (D), 1118.
——Water, new method in 37,500-hp. turbine test, *591, comment, 578.
——Weston standard cell, abnormal behavior. By M. G. Mellon, 724.
Merchandising, central-station:
——Advertising essential to successful merchandising, 439.
——and sales policies, 495.
——Central-station company, 1227.
——Central-station profits that stay afloat, 1029.
——Chicago electrical men oppose regulation of sale of eleectrical goods, 785.
——Department-store methods applied to electrical store, 51.
——Flatirons, to make comparative tests of, 728.
——Policy, Interview by A. S. Nichols, 158.
——Purchasing, careless, lessens profit, 326.
——Sales campaigns a valuable part of policy, 215.
——Salesmen's compensation, Commonwealth Edison's system, 1494.
——Small central-station merchandising, 835.
——Small communities, 381.
Merowit, W. G., 962.
Metallurgy, Effect of rate of cooling on the magnetic and other properties of an appealed eutectoid carbon steel. By C. Nusbaum and W. L. Cheney (D), 1062.
Meters:
——Ammeters, resistance box for testing. By P. E. Alger, *262.
——Connected in neutral wire registers incorrectly. By Harry S. Rush, *206.
——Connections, checking. By Halbert R. Thomas, 1105.
——Connections, checking. By William B. Korswenhoven, 768.
——Connections, installation which permits easy check on. By Albert R. Thomas, *488.
——Defects in. By Walter Lawson (D), 498.
——Demand, selection of. By Willard S. Wilder, *877.
——Gate-opening indicator used for indicating kilowatts. By R. W. Loyd, *1051.
——Graphic form of records for chowing cost of testing meters, *1051.
——Graphic representation of cost of meter reading, 1319.
——Industrial metering, how far to carry. By W. B. Todd, *469.
——Inspection, regular, a money saver. By A. L. Johnston, *1425; Comment, 1408.
——Leads, standardization is desired. By S. A. Fletcher, 769.
——Maintenance, simplifying. By J. C. Langdell, *249.
——Outdoor installation for suburban customers. By S. E. Evans, *994.
——Outdoor standard equipment. By C. E. Young, *882.
——Outdoor substations, box for, 1320.
——Polyphase, on three-wire, single-phase loads. By S. C. Henton, *151.
——Precision form of the Kelvin electrostatic voltmeter. By E. H. Rayner (D), 893.
——Saving by leaving disconnected on premises, 52.
——Single-phase meters on three-phases power service. By S. C. Henton, 712; Correction, *1486.
——Tampering with, responsibility, 1450.
——Test board, standardized laboratory. By Halbert A. Thomas, *429
——Test form, *833.
——Testing, cover should be on. By S. A. Fletcher, 601.
——Testing, speedy. By B. R. Payne, *47.
——Total, one meter measures total power on two buses. By S. A. Fletcher, *1255.
——Wattmeter, integrating, accuracy and testing. By W. K. Hervey (D), 218.
——Wattmeter readings, correcting, for phase-angle errors. By E. D. Doyle, *314.
Metric system bill introduced into Senate, 113.
Mexico to develop a 100,000-hp. hydro-electric project, 58.
Meyer, William F., 1452.
Michigan Committee on Public Utility Information organizes, 445.
Middle West Utilities Company:
——Physical features, 1211, comment, 1209.
——Growth, 1217.
Milford, G. R., *1072.
Miller, Stephen I., 1073.
Millham, E. T., 119.
Milwaukee, Lakeside power plant, 55.
Mines:
——Cable installation, heavy. By T. H. Arnold, 887.
——Cables, selection and installation, *325.
——Electricity in, paper. By Graham Bright, 1472.
——Hoists, three-phase induction motor drive for. By P. Escande (D), 1327.

*Indicates illustrated articles

Mines (Continued):
——Signal switch, oil-insulated, *156.
——State regulations on the use of electricity in coal mines increasing. By L. C. Issley, *763, comment, 751.
——Winders, electrical. By J. Kirkwood (D), 1498.
Miniger, C. O., 621.
Minner, P. S., *849.
Minor, C. H., 286.
Mirrors, preservation of laboratory. By Louis Bell, 1165.
Missouri Association of Public Utilities, 732.
Mitchell, Charles Edwin, *1186.
Moffat, P. V., 1394.
Moore, David, 286.
Morris, Shiras, *905, 1018.
Morton, W. D., Jr., *972.
Moulton, H. J., *1130.
Moyer, H. J., 286.
Motors:
——Adjustable speed, efficiency. By R. W. Owens (D), 216.
——Air gaps, enlarging, for heavy-duty motors, 999.
——Alternating current, and control equipment. By G. J. Kirkgasser and E. W. Seeger (D), 497.
——Applications, considerations in. By Philip Chapin Jones (D), 1261.
——Bearings and oil must be watched closely. By H. S. Rich, 1258.
——Brush and commutator trouble presented. By A. L. Heath, 1376.
——Brushes, incorrect spacing wears, 1377.
——Brush trouble eliminated. By A. Hervey, 1435.
——Coil-end leakage of armature windings of single-phase commutator motors. By F. Unger (D), 780.
——Conductors, submerged, locating. By F. W. Gay, *829.
——Continuous rated or 50-deg. rise motors. By L. F. Adams (D), 1061.
——Control equipment and its application. By G. J. Kirkgasser and E. W. Seeger (D), 107.
——Cost, includes breakdown expense. By James Dixon, 208.
——Dampness causes burned-out motor coils and belt slippage. By Arthur R. McDonald, *1168.
——Delta-star for agricultural use. By H. Roth (D), 837.
——Forty-deg. standard, British Association holds to, 1443.
——Growth of industrial motor service, 74.
——Heat flow in slot-wound armature coils. By Carl J. Fechheimer (D), 892.
——Individual drive with motors mounted separate from machine. By Albert Kochs, *490.
——Induction. By B. G. Lamme (D), 780.
——Induction, diagram, new views on. By R. G. Warner, *980; Comment, 1369.
——Induction, short-circuit current of induction. By R. E. Doherty and E. T. Williamson (D), 328.
——Induction, synchronized. By Le Monnier (D), 272.
——Induction, vector diagrams for. By J. Monnier (D), 1327.
——Induction, with double-cage rotor (D), 1497.
——Inspection, close, insures good service. By L. N. Burhoe, *774.
——Inspection form for large motors. By R. P. King, *436.
——Inspection records, correct filing of. By James Dixon, 321.
——Installation, factors to investigate before installing motors, 211.
——Mounting. By J. S. Thomas, *595.
——Mounting emergency. By H. S. Rich, *546.
——Mounting on conveyor, weatherproof compact. By Eugene Carpenter, *376.
——Oil-well drilling, motor drive becoming standardized. By W. G. Lane, *155.
——Pigtails and large number of brushes dissipate heat, 1324.
——Plug, non-reversible, for three-phase motor. By H. S. Rich, 1110.
——Polyphase, place compensation for. By Val A. Flynn (D), 384.
——Pulley, too small, caused bearing to burn out. By B. F. Bailey, 997.
——Pump motor mounted above floor to prevent burn-outs. By H. S. Rich, 156.
——Ratings, study of, makes possible reduction in number of sizes. By C. W. Starker, 774.
——Record card, *1321.
——Record system for plant with several departments. By H. L. Burns, *49.
——Repulsion, circle diagram. By E. Siegel (D), 1439.
——Repulsion-induction motor, determining rotation of. By A. Hervey, *154.
——Requirements for meeting unusual service conditions. By J. Elmer Housley, 1112.
——Slip regulators vs. notchbacks. By Gordon Gage (D), 440.
——Slip-ring, slow-down resistance for, 945.
——Slip-ring, speed variation due to faulty secondary fuse. By Harry Rush, 325.
——Speed of small motors determined by rotating-disk comparison. By W. H. Farr, *1057.
——Split-phase motors design of. By E. A. Binney (D), 1061.
——Squirrel-cage, number of bars and torque of. By W. Stiel (D), 1005.
——Starter, determination of steps in for series motor. By Stanley Parker (D), 213.
——Supplying direct current to slip rings of induction motor. By Bieger Nordfeldt, 936.
——Synchronous self-starting, 1435
Motors (Continued):
——Synchronous speed, small motors made to run at. By Philip C. Bernholz, *1376.
——Synchronous, starting under load. By E. E. George, 198.
——Temperature, judging, by feeling with hand. By William Thomson, 1378.
——Variable speed, in heavy industries. By S. Parker Smith (D), 1382.
——Variable-speed shunt commutator, theory of. By J. L. D. Ridsdale (D), 1260.
——Ventilation, unique scheme for polyphase motors, *879.
——With short-circuited slip rings will not start. By R. H. N. Lockyer, 268.
Motor repairs and maintenance:
——Air brush made from old torch for applying insulating paint. By R. H. N. Lockyer, *772.
——Armature, repairing a grounded and poorly soldered. By A. Hervey, 322.
——Baking armature reduces number of repairs, *491.
——Baking partially rewound armatures and fields. By F. W. Gay, 603.
——Bar-to-bar test on small armatures, support for. By Frank Soete, *943.
——Changing 60-cycle motor for 40-cycle operation. By William Thomson, 1321.
——Cleaning dirty motors before repair. By N. S. Davis, 547.
——Coil puller, adjustable home-made. By R. H. N. Lockyer, *548.
——Coils, impregnated, air hammer forces out of slots. By E. R. Debman, *1493.
——Commutators, soldering large, by electric arc. By R. H. N. Lockyer, *376.
——Commutators, tool rest for turning. By R. H. N. Lockyer, *656.
——Commutation trouble causes. By James Dixon, 435.
——Diagrams, simplified, of motor connections. By Ralph McKinney, *208.
——Dipping and baking armatures. By John S. Dean, *1055.
——Drying out. By Amédée Anchtil, *606.
——End rings, loose welding, on squirrel-cage rotors. By E. R. Debman, *999.
——Halving a motor's voltage in a difficult case. By E. R. Debman, *1110.
——Halving voltage on a wave-wound induction motor. By A. C. Roe, *717.
——Increasing speed and horsepower of a slip-ring induction motor. By A. C. Roe, *100.
——Insulating coils, block for. By L. E. Wood, *264.
——Ground, solid, locating in an armature. By F. W. Gay, *775.
——Overheating of improperly connected series a.c. motors. By A. C. Roe, *432.
——Pinions and pulleys, home-made "come-along" for drawing. By Walter B. Atchinson, *50.
——Polarity, kick method of testing coils for. By F. W. Gay, *716.
——Records, machine and motor, aid speedy repairs. By A. G. Humphrey, *776.
——Reversed coils, kick method of location. By F. W. Gay, *884.
——Rotors, squirrel-cage, repairing. By A. Hervey, 832.
——Shaft end welded without removing winding. By D. W. Blakeslee, 830.
——Shop may be likened to hospital. By James Dixon, 493.
——Slotting machine for undercutting mica. By R. H. N. Lockyer, *1170.
——Threaded-in chain winding replaced by formed coils. By C. A. Johnson, *1323.
——Utilizing "dead" coils in motor for emergency repair. By William Thomson, 1257.
——Wedges, tool for driving out. By A. C. Roe, *656.
——Winding a small armature quickly. By Frank Soete, *1054.
Mudgett, O. D., 509.
Mueller, C. H., 1186.
Municipal ownership:
——Co-operative municipal development of water powers voted down, 1121.
——Development in California cities, 1262.
——Inquiry at Boston, 1010.
——Interests oppose Washington utility bill, 953.
——Los Angeles would obtain private plant by condemnation, 1443.
——New York's governor against, 275.
——Plant not free from need for depreciation reserve—228.
Murdock, Philip K., 1018.
Murkland, S. Wallace, 1452.
Muscle Shoals (see also Hydroelectric developments):
——Dam, farm bureau urges completion, 1330.
——Failure to appropriate funds to continue, 113.
——House votes down appropriation, 555.
——Plant, completion urged, *587, comment, 577.
——Senate passes bill to place under government corporation, 221.
——Weeks would complete, 782.

N

National Association of Electrical Contractors and Dealers, 110.
National Electrical Credit Association Delinquent accounts in, 1337.
National Electric Light Association, 805.
——Activities enlarged (comment), 185.
——Chicago conventions of 1885 and 1921, 1085.
——Comment, front of May 28 issue.
National Electric Light Association (Continued):
——Commercial Committee men see benefits in high freight rates, 166.
——Commercial section of the New England Division, 731, 777.
——Convention:
Chicago chosen for (comment), 409.
Chicago, May 31, June 3, 3[illegible]. Report, *1285.
——"Electrical Salesman's Handbook" revised edition, 1014.
——Good-will advertising program under way, 279.
——Lighting Sales Bureau (comment), 1351.
——Light up and be seen (comment), 521.
——National good will for utilities is aim, 213.
——New era dawns for, *1357.
——North Central division discusses rural service and inductive interference, 1501.
——Northwest division discusses public relations, 1503.
——Pacific Coast convention, 1444.
——Plans for new year to be laid, 1501.
——Power commission agree on water-power regulations, 897.
——Prime movers report (comment), 1350.
——Safety rules, no longer objects to oil-filled apparatus, 334.
——Southeastern Section, Miami convention, 271.
——Southwest Section, *1181.
——State information committees organized in South, 1501.
——Wiring committee, 608.
National electrical safety code, 841.
Nauen wireless station, 148.
Nebraska commission powers not extended, 1182.
Neill, W. T., 1509.
Neiswanger, E. B., 173.
Networks, direct-current, calculating the potential relationships and fault resistances of. By G. W. Stubbins (D), 162.
New England:
——Association of Central Station Power Engineers affiliate with N.E.L.A., 226.
——Association of Electrical Inspectors favors separation of codes, 843.
——Division men hear industrial heating lecturers, 1124.
——Electrical development committee formed, 280.
——Electrical League formed at Boston, 277.
——Electrical League launched, 332.
——Electrical Sales Associates organized, 446.
——Electrical Supply Jobbers' Club meeting, 671.
——Hydro-electric company's consolidation forecast, 504.
——New England Power Company to build million dollar hydro-electric plant, 1329.
——Public Utilities Information Bureau organized, 1446.
New England, western, inspection conference, 1390.
New Jersey:
——Board of Public Utility Commissioners, Service extension rules, 110.
——Heavy power demand in 1920, 335.
New Mexico Electrical Assn. convention, 503.
New Orleans Railway & Light Company, Service at cost proposed, 556.
——Unable to meet demands, 1448.
New York:
——Edison Company announces specialized exhibit plan, 668.
——Electrical League elects officers, 169.
——Hell Gate station of the United Electric Light & Power Co., *140.
——One commission for state, 111.
——State will require 3,500,000 additional hp. by 1930, 386.
——United Electric Light & Power Company Advertisements stimulate house-wiring business, 1326.
——Vehicle Show, holds successful, 333.
——Water-power situation, utility men to hear about, 332.
Niagara:
——Hydraulic power canal ground broken, 1329.
——Power applications heard Jan. 24, 57.
——Treaty revision, recommendations for. By Col. J. G. Warren, 90.
Niagara Falls Power Company:
——To use higher head, 1384.
——Water measurement, new method, *591.
Nicholls, Frederic, 920.
Nichols, Ernest Fox, *849.
Niez, Homer Eldredge, *229.
Nitrogen fixation cost in Norway. By T. C. Hagemann (D), 1007.
Noack, H. R., *1130.
North American Company, Electric service big factor in income of North American subsidiaries, 618.
Northcutt, C. S., *905.
Norway:
——And Sweden, development of electricity supply, 1159.
——Hydro-electric power. By W. E. Williams (D), 385.

O

Oatley, Henry B., 738.
Ohio Electric Light Association; metermen discuss power factor and line-loss measurements, 335.
Ohio power-load figures reflect industrial conditions, 1069.
Oil fields of Kansas partly electrified, 533.
Oil, fuel:
——And the electrical industry, 975.
——Banking vs. oil-burner losses. By F. H. Daniels, 196.

*Indicates illustrated articles

Oil, fuel (Continued):
——Narragansett Company saves $362,000 by use of, 563.
Oil, insulating:
——Deleterious effect of fibers on the electric insulating power of oils. By Thomas A. McLaughlin (D), 1006.
——Serious effects of fiber shreds in transformer oil, 918.
Oil-well drinning, motor drive for, becoming standardized. By W. G. Lane, *155.
——Power required, *1111.
Oil-well pumping, motor solution for. By W. G. Lane, *323.
Oneal, Lloyd E., 962.
Ontario:
——Engineers prepare bill for professional recognition, 114.
——Hydro-Electric Commission lower rates, 1182.
——Municipal Electricians' Association condemns motor rental, 561.
Optical effects caused by electrons. By J. J. Thomson (D), 274.
Organizing for efficient operation. By Walter P. Schwabe, 1229.
Osgood, Harry W., 286.
Osthoff, Otto E., 62.
Outlets, architects' plans should provide adequate. By Israel Lovett, 1370.

P

Pacific Gas and Electric Company, Pit River, half -million horsepower. By A. H. Markwart, *581, comment, 579.
Pacific Power & Light Company not contemplating new plants, 1445.
Paine, Alfred J., 678.
Palmer, E. A., 229.
Paper mill:
——Automatic speed control for sectional paper-machine drive. By Stephen A. Staege (D) 951, (D) 1062.
——Direct-current motors kept in synchronism, *546.
——Drive for. By W. W. Cronkhite, W. L. Merrill and H. W. Rogers (D), 611.
——Drive, speed control. By S. A. Staege, *602.
——Sulphite, 50-ton, requires 1,500-hp. in motors. By H. E. Stafford, *265.
Patent Office:
——Bill reported out, 1502.
——Higher salaries and larger force seem assured, 503.
——Salaries, conferees approve provision for higher, 390.
Patton, T. B., 1509.
Payne, R. P., 1130.
Pearson, Benjamin F., *1186.
Peat, super-power plant for utilization. By F. Bartel (D), 161.
Pegg, E. F., *791.
Penstock, lowering into place, *599.
Pennsylvania Electric Association:
——April meeting, 843.
——Meeting, 1325.
Pennsylvania Power & Light Company, to add 20,000-kw. unit, 1012.
Pennsylvania Water & Power Company units await lower prices, 448.
Pennsylvania waterpower conferences to be held, 1502.
Peterman, L. C., 565.
Peters, T. W., *962.
Perkins, O. H., 1130.
Phase rotation, avoiding change of, 488.
Philadelphia Electric Company:
——Delaware station, *1145, comment 1142.
——Relay tests and inspection. By Raymond Bailey, *809, comment 806.
Philipines, electric service in, 620.
Phillips, Irving W., 119.
Photo-active cell. By C. C. Murdick (D), 1499.
Photo-elastic method. By A. L. Kimball, Jr. (D), 781.
Photo-electric effect in audion bulbs of the oxide-coated-filament type. By Theodore W. Case (D), 1175.
Photo-electric properties of molybdenite, etc. By W. W. Coblentz (D), 554.
Photometer:
——Errors from paint and window in photometric sphere, 368.
——Portable, small, shows accuracy. By Davis Turk, *476.
——Precision integrating, whitened cube as. By H. Buckley (D), 839.
Photometry, applications of photoelectric cell to. By W. E. Story, Jr. (D), 162.
——Commercial. By A. L. Powell and J. A. Summers (D), *216.
Pit River, half-million horsepower development. By A. H. Markwart, *581, comment, 579.
Planers, safe arrangement for. By H. Becker (D), 723.
Platt, H. M., 737.
Pole rack for river span. By R. F. Mundorr, *318.
Poles: Wood, preservative treatment of. By R. V. Achatz (D), 385.
Politicians, bushwhacking and the utilities, 73.
Politics not good for utilities (comment), 1407.
Porterfield, W. A., *906.
Port operation, electrifying facilities. By Commander C. S. McDowell, *365.
Power: Costs during the years 1914 to 1919. By Hubert E. Collins (D), 161.
Power-factor, Charts to solve correction problems. By Albert Rudin, *101; Correction, 436.
——Correction by synchronous motors. By Rene Martin (D), 1061.
Power factor (Continued):
——Correction has been shown to pay, 168.
——Correct motor sizes prevent low, 716.
——French contract that equitably handles a variable-power-factor demand, *1090.
——How should power factor be handled. By Charles J. Russell, *1089.
——Improving by use of induction motors, 149. By Quentin Graham.
——Points to consider in adjusting for, 663.
——Synchronous motors for raising. By C. W. Drake, 659.
Power situation during the war, 787.
Power stations. By H. P. Liversidge.
Power stations, winter, in Switzerland, 816.
Prager, Arthur, 677.
Precipitation plant, troubles prevented in. By R. H. N. Lockyer, *493.
Preservation, American wood preservation methods. By Boyer (D), 665.
Presses, device to prevent operators' hands being caught in. By W. A. Harris, *321.
Price, Frank Shreve, *752.
Priest rapids, projected development Washington Irrigation & Development Company, 139.
Pritchard, G. S., 173.
Prussia, East, electrification in, 217.
Public service commissions' unenviable position, 890.
Public utility outlook. By Martin J. Insull, 3.
Pulliam, J. P., *1018.
Pulp mill, distributing power costs in a pulp mill using 1,500 hp. By H. E. Stafford, 1000.
Pumping-plant, standardized, substation for Arizona valley, *1053.
Pumping, water, domestic, characteristics and costs, 494.
Pumps, centrifugal variable-speed induction motors for. By M. L. Enger and W. J. Putnam (D), 107.
——Pilot lamp indicates operating of. By A. J. Dixon, *606.
Pupin, Michael Idvorsky, *412.
——Edison medal, 500.
——This year's Edison medalist, 55.
Purdon, Arthur, 622.
Purdy, C. H., 1394.
Public relations:
——Advertisements, city's industrial growth depends on power supply, 105.
——Advertisements of United Electric Light & Power (D) stimulate housewiring, 1326.
——Advertising, typing in local, with national good-will publicity, *891.
——Bank advertisements commend utilities.
——Booklet tells consumers of company's aims and achievements, *381.
——"Build business for the long run," says L. H. Parker, 1012.
——Carrying the utility message to the people, 633.
——"Colliers" asks a square deal for utilities, 661.
——Complaints, consumers pleased by handling of telephone, 496.
——Consumer and employee on directorate, Brooklyn utility to have, *381.
——Contractor-dealers to promote good will for utilities, 330.
——Contractors backing up N.E.L.A. advertising, 719.
——Co-operation between central stations and isolated plants. By Warren B. Lewis, 203.
——Courtesy gains customers' appreciation, 946.
——Courtesy, organizing, to build good will, Boston Edison Company, *1157.
——Customer ownership and (comment), 409.
——Dangers of over-complacency. By S. M. Kennedy, 535, comment 522.
——Explanation of service interruptions a good-will asset, 948.
——Good-will message, "kilo watt" pamphlet carries, *834.
——Good will, promoting, by department of "greater service."
——Good will, stepping stones to (comment), 297.
——Growth to come through public information. By Norman Read, 1225.
——Hydro-electric develpoment, newspaper points to necessity of, 890.
——Interest of public in utility development. By James A. Perry, 1379.
——Main theme of Southwest Section convention N.E.L.A., *1181.
——Making the partnership between utilities and consumers a harmonious one, 1165. By E. B. Neiswanger.
——Meter readers can create or destroy good will. By R. S. Seese, 1252.
——Meter readers, goodwill sometimes better than efficiency in (comment), 1408.
——Nebraska Power Company's inspection tours improve public relations. By F. E. Davidson, *1173.
——New York Company promotes good will, *835.
——Northwestern division, N.E.L.A., discusses, 1503.
——Owners of public utilities, real, 383.
——Power business changed in Northern States Power Company, 1506.
——Promoting good understanding between utilities and people, 1436.
——Public viewpoint. By Harford Powel, Jr., 1353.
——Public interest in utility development, 1349.
——Reserved police power and "scraps of paper," 1031.
Public Relations (Continued):
——Students, to instruct public school, in rudiments of utility operation, 383.
——Transforming public opinion. By S. M. Kennedy, 1230.
——Trouble calls, prompt attention to, creates good will, *889.
——Utilities can hasten, how, 326.
Pyrometric practice. By P. D. Foote, C. O. Fairchild and T. R. Harrison (D), 1499.

R

Radio:
——Amateurs, elementary information for (D), 1175.
——Amplification, short-wave, new system. By Edwin H. Armstrong (D), 951.
——Antenna, new type of condenser. By S. R. Winters (D), 1118.
——Antennas, flat-top, capacitance. By W. H. Eccles (D), 554.
——Aviation, development in. By M. Bernard (D), 1440.
——Carrier-current telephony and telegraphy. By E. H. Colpitts and O. B. Blackwell (D), 1118.
——Cathode-ray oscillography and its application in radio work. By Lewis M. Hull (D), 1261.
——China, station in, 1506.
——Communication, continuous wave. By D. G. Little (D), 1383.
——Communication, Yap and modern methods, 805.
——Coupled currents, frequencies and damping factors. By Louis Cohen (D), 1383.
——Damped electric oscillations. By R. B Abbott (D), 1328.
——Deutsch-Altenburg station. By J. Mayer and Dr. L. Hogelsberger (D), 724.
——Electron tubes, some operating characteristics of. By W. C. White (D), 1261.
——Engineers, Institute of, Alexanderson urges international service for radio engineers, 450.
——Fog signals to protect navigation, 674.
——French super-radio station, 170.
——Generators for the Army and Navy. By F. I. Hiss (D), 161.
——German research (D), 274.
——Heterodwne receiver. By J. V. L. Hogan (D), 1118.
——High-frequency absorber. By G. Faccioli and H. G. Brinton (D), 1499.
——High frequency for radiation. By J. Slepian, *1175.
——High-tension direct-current machinery for radio spark stations. By Rogowski (D), 54.
——How central station can popularize. By Orville R. Toman, 1484.
——Lafayette radio station. By S. C. Hooper (D), 1118.
——Moorhead vacuum valves. By O. B. Moorhead and E. C. Lange (D), 1383.
——Nauen high-power station. By Felix Linke (D), 893.
——Nauen wireless station, 148.
——Paris, importance of radio center of, 1383.
——Paris-to-London service (D), 1261.
——Post Office station, first messages, 1013.
——Poulsen arc in coupled circuits. By P. O. Pederson (D), 1499.
——Railroad signals (D), 554.
——Range of wireless stations. By R. Chenevic Trench (D), 951.
——Record, navy makes new long-distance, 615.
——Reduction of atmospheric disturbances in radio reception. By Louis W. Austin (D), 951.
——Relation between atmospheric disturbances and wave length in radio reception. By Louis W. Austin (D), 951.
——Static, determining direction of. By L. W. Austin (D), 1499.
——Static frequency doubler in radio engineering practice. By Frederick C. Ryan (D), 54.
——Static frequency troubles. By J. F. Peters (D), 1382.
——Telegraphy, generators. By Karl Schmidt (D), 1383.
——Telegraphy, rapid. By J. Brun (D), 1328.
Telegraphy:
Submarine. By Philip R. Coursey (D), 441.
Thermionic valves for naval uses. By B. S. Gossling (D), 441.
Telephony:
Consumers Power Company to use, 336.
Long-distance now practicable. By J. H. Dellinger, 142, comment, 130.
Digest of United States patents. By John B. Brady (D), 1175.
Experiments conducted to popularize, 672.
——Thousand-mile amateur radiophone. By J. O. Smith (D), 951.
——To aid load dispatching of southern interconnection, 900.
——Transmission, characteristics of frequency doubler applied to. By T. Minohara (D), 108.
——Undamped oscillations in coupled circuits (D), 218.
——Vacuum tube amplifiers in parallel. By R. V. L. Hartley (D), 1499.
——Vacuum tube, three-electrode, as an oscillation generator. By Eijiro Takagishi (D), 1261.
——Vacuum tubes, two new. By Pierre H. Boucheron (D), 498.
——Valve circuits for measuring physical quantities. By R. Whidington (D), 611.
——Wired, load characteristics. By R. D. Duncan, 1164.

*Indicates illustrated articles

Telephony (Continued):
——Wired radio, recent attainments, 634.
——Wired, recent attainments. By R. D. Duncan, Jr. (D), 498.
——Wired wireless transmission. By Philip R. Coursey (D), 611.
Rae, Robert E., 738.
Rahm, Edward, Jr., 1452.
Railways:
——Bond testers, portable. By G. H. McKelway (D), 1062.
——Contact systems. By Philip Dawson (D), 328.
——Electrification:
Chicago, Milwaukee & St. Paul (D), 440.
Economic aspects of. By A. H. Armstrong D), 1117.
France, *643.
In Austria (D), 107.
Indian (D), 217.
Magdeburg-Leipsic-Halle. By Heyden (D), 54.
Main-line railways in relation to traffic working. By Philip Nash (D), 1006.
Necessity for heavy traffic, 558.
Recent (D), 1260.
St. Paul Railroad electrified, branch of (D), 1062.
——Electric heating on Swiss railroads. By Henry L. Geissel, 1485.
——Locomotives, changes in, to meet demands for heavier duty. By Graham Bright, (D), 328.
——New York and New Jersey Port and Harbor Development Commission (D), 440.
——Snow-fighting methods. By E. Sears (D), 385.
——Status of foreign electrification. By E. C. Zehme, 527.
——Substations, automatic railways. By Charles H. Jones (D), 385.
Railroad telegraph and telephone engineering. By Stanley Rhoads (D), 724.
Randall, R. B., 1394.
Ransom, Allen A., 510.
Rates (see also Regulation and valuation):
——Adequate service must precede higher rates, 960.
——Adjustments, satisfactory service essential factor in, 395.
——Advance in rate by producing company does not warrant corresponding increase by distributing company, 790.
——Apportionment of bills after rate change, 1184.
——Apportionment of expenses between departments, 1071.
——Basic rates for government electrical workers, 57.
——Basing rates upon 100 per cent efficiency, 1071.
——Basis of charge for service connections, 736.
——Basis, unit, for wholesale and retail. By N. A. Kemmish, *425.
——California commission orders 6 per cent cut, 898.
——California rates reduced by another 4 per cent, 1329.
——California tax bill followed by petitions for higher rates, 952.
——Cambridge (Mass.) Elec. Light Company surcharge and fuel charge, 109.
——Changes, effective date of, 1496
——Charges, apportionment of gas and electric, 61.
——Charges for service connections, 172.
——Charges, service and minimum, 61.
——Cities cannot enforce low rates on contract theory, 895.
——City in error in taking rate case to courts first, 1063.
——Coal clause as applied to special service and to supply from hydro electric source, 395.
——Coal clause, Boston City council opposes, 500.
——Coal clause explained to customers, 270.
——Coal "rider" and the minimum charge, 848.
——Coal riders, justification of, 61.
——Combined minimum and service charge, 620.
——Company can collect legitimate charge accidentally omitted from statement of account, 620.
——Company cannot advance rates by filing tariff, 848.
——Compensation to city in return for cancellation of franchise, 904.
——Consumers' Power Company does not think straight rates are better than combination. By B. C. Cobb, 541.
——Continued at East St. Louis, 61.
——Contract rates and public service commission's powers in Vermont, 117.
——Contracts, which are not discriminatory or unreasonable defended against supersession, 339.
——Cost of living increased compared with public utility rates, *1002.
——Cost of waiving rights must be borne by utility, 1071.
——Cost plus, 20 per cent paid by railways, 1496.
——Costs, power, apportioned among classes of customers. By G. E. Quinan, 1494.
——Rates, customers of power companies contesting, entitled to copies of others' contracts, 396.
——Decisions in Utah, 117.
——Deficit in water department must not be recouped by increase in electric, 848.
——Demand-charge rate form favored at Wisconsin Electrical Association meeting, 784.
——Differentials as applied to domestic consumers, 117.
Rates (see also Regulation and Valuation) (Continued):
——District of Columbia consumers cannot claim equal treatment with government, 1016.
——Dollar charge for first kilowatt-hour disallowed, 1124.
——Economist urges 9 or 10 per cent, 824.
——Efficiency insisted on, 508.
——Efficiency, rewards for, 1071.
——Emergency relief not always justified, 1016.
——Every division of a joint public service company must stand on its own feet, 1016.
——Extensions of service as affected by rate of return, 676.
——Fair return even in periods of depression, 1335, 1504.
——Federal judge sanctions 25 per cent profit on gas, 396.
——Franchise rate not changed on ground of unprofitableness, 903.
——Fuel, cost of, effects in North Dakota, 228.
——Fuel charge, Vermont commission orders eliminated, 1496.
——Galena, Ill., ordered lowered, 1496.
——Gas and electric departments, 904.
——Gas rate acceptance and electric rate nonacceptance, 452.
——Government may obtain service rates lower than private customers, 729.
——Granting rate increases, 676.
——Hawaii commission's attitude, 1496.
——Hearing must precede order to increase rates, 903.
——Higher rates wait on improved service, 57.
——Increased rates refused because of unsatisfactory service, 960.
——Increase in contract rate between companies, 1184.
——Increase, proposed 70 to 300 per cent in municipal power rates is unreasonable, 395.
——Increases backfire of (comment), 241.
——Increases, electricity and water, adjusted, 452.
——Increases, good service must precede, 452.
——Indiana increased, 1450.
——Inductive loads, for. By F. Scoumanne (D), 839.
——Insufficiency of schedules, *13.
——Interest on bonds not an operating expense, 736.
——Judicial department cannot change public policy as to utility rates, 117.
——Jurisdiction to restrain, 61.
——Load factor, relation of to diversity of uses, 1128.
——Loss, eighteen months' operation at loss entitles company to relief, 284.
——Low financial burdens and, 73.
——Maximum demand, tables for estimating. By W. W. Arnett, Jr., 1172.
——Minimum bill as a demand charge, 172.
——Municipality can control rates in opposition to state commission in Colorado, 1128.
——Must have fair trial before being declared confiscatory, 620.
——Narragansett Electric Lighting Company rate, 109.
——Necessity of new power house, 1184.
——New Hampshire Commission on valuation methods, 736.
——New Hampshire commission reduces Plymouth Company rates, 1126.
——New Jersey utilities, would prohibit from raising rates for one year, 332.
——North Dakota Public Utilities Act not to affect rates, 903.
——Ontario Hydro-Electric Commission lower rates, 1182.
——Operating expenses include federal income tax, 903.
——Power factor and adequate rates, 975.
——Power factor rate that works both ways. By M. L. Sindeband, 1369.
——Power of courts and commissions over, 508.
——Prediction of proper rates, 1392.
——Preferential rates refused to city, 960.
——Privileges to directors are discriminatory, 676.
——Profitable and unprofitable years must be considered together, 1184.
——Property values, utility (comment), 409.
——Publicity of accounts reduces number of cases, 1180.
——Public sentiment squelches opposition to increase, 552.
——Reasonable return from extensions essential, 848.
——Reduced rates to city, 172.
——Refunding in 1921 to be almost $100,000,000, 112.
——Relation between rates and ability to command new capital, 1016.
——Relation of stand-by plants to allocation of costs, 736.
——Return of 8.4 per cent indicates prosperity, 339.
——Return to normal water conditions brings reduction in agricultural rates, 1016.
——Rural rates in Illinois, 1268.
——Rural rates should be based on value of service, 1115. Comment, 1086.
——Salaries criticised by New York Commission, 1491.
——Service charge legislation rejected in Connecticut, 1066.
——Service charge permitted small company operating several businesses, 61.
——Service charge permitted for gas but denied for electricity, 1268.
——Service connection charges, 395.
——Sinking-fund payments are not operating expenses, 904.
——Sliding scale for lighting rates sustained 904.
——Small company's power rates consistent with use, *1380.
Rates (see also Regulation and Valuation (Continued):
——Small utility gets increaseed rates in advance of improved service, 736.
——Southern California Edison rates, seven per cent reduction, 334.
——Steam-heating, advanced, 117.
——Steam-heating service is by-product of electric service, never vice versa, 1071.
——Street lighting and commercial lighting compared, 620.
——Surcharge abolition, 61.
——Surcharge allowed California companies cut from 15 to 10 per cent, 952.
——Surcharge and full clause granted Cambridge company in lieu of flat rate increase, 339.
——Tax, income, as it affects the rate of return, 620.
——Thirty per cent surcharge to cover transition period of municipal plant, 228.
——Twenty per cent lighting penalty exorbitant, 904.
——Unit basis for wholesale and retail. By N. A. Kemmish, 425; Comment, 465.
——Utility may sue to establish fair rate, 228.
——War conditions did not excuse errors in bills, 736.
——Washington commission law as it affects change of rate, 676.
——Worcester company reduces, 391.
——Worcester company reduces power rates, 615.
Reactors, current-limiting, three-phase. By M. E. Skinner (D), 329.
Rectifiers, mercury-arc, high-power. By Biroz (D), 722.
——For large output. By M. Giroz (D), 1005.
Reed, Charles W., 962.
Regulation (see also court decisions, contracts, legislation and rates):
——California commission investigation aims to restore public confidence, 388.
——Claim that losses give "business value" called absurd, 339.
——Comment, 465.
——Contract offending interest of general public disallowed, 395.
——Co-operation between company and patrons, 395.
——Deposits to cover cost of service connections prohibited, 395.
——Discontinue service, effect of application to, 452.
——Dual utility, 1496.
——Georgia commission's views on rate fixings, 395.
——Illinois, Governor Small appoints new utility commission, 388.
——Indiana engineers support utility commission, 388.
——Kansas would separate utility regulation from industrial court, 388.
——Michigan commission disapproves "coal clause," 391.
——New Jersey, to take power of removal of utility board from governor, 388.
——North Dakota commission's power, 395.
——Public misinformed, says Missouri commissioner Noah W. Simpson, 52.
——San Francsico business men support state commission, 334.
——Service free to municipalities condemned, 395.
——Service, compulsory, 1450.
——Service, continued to consumer in default is discrimination, 1184.
——Service extension, duty of utility in, 1496.
——Service, extension of service to unprofitable locality, 1335.
——Service, extension rules, New Jersey Board of Public Utility Commissioners, 110.
——Service, inadequate service, responsibility for, 904.
——Service, night service, 1185.
——Service, refusal of service where amount due is in dispute, 1335.
——Service standards and original cost, 676.
——State regulation of utilities essential, governors hold, 363; comment, 353.
——West Virginia commission being officially investigated, 388.
——Wiring, interior, municipal regulation of, 452.
——Yale Law School, supplementary course on, 447.
Relays:
——Applications and testing practice. By H. P. Sleeper (D), 161.
——Application to large power systems. By R. F. Gooding, *1421; Comment, 1409
——Connections, typical. By Lewis A. Terren (D), 217.
——For strong currents (D), 554.
——Reverse-power, testing. By A. N. Geyer, 940.
——Reverse-power, testing without removing leads. By Raymond Bailey, *319.
——Selection for large power system. By R. F. Gooding, *987.
——Tendencies in protection. By R. N. Conwell, 255. Comment, 242.
——Tests and inspection. By Raymond Bailey, *809. Comment, 806.
——Toronto Power Company's system. By P. Ackerman (D), 1498.
Research, engineering foundation need for scientific research on large scale urged, 1182.
Research in progress and completed and suggestions for, 163, 442, 666, 894, 1176, 1441.
Resistance of metals. By P. W. Bridgman (D), 838.
Resistance regulators with saving in resistance material. By R. Richter (D), 1118.
Resistance, wide variation of, obtained with three switches. By Victor M. Arana, *325.
Resistor materials used for heating purposes. By H. O. Swoboda, 944.

*Indicates illustrated articles

Respess, Roland B., 738.
Resuscitation from shock by prone-pressure method, 652.
Rheostat, barrel, 1,600 amp. at 125 volts. By Frank H. Broome, *827.
——Fresh-water handles 900 kw. at 4,000 volts. By D. J. Locke, *1428.
Rhode Island Electrical League starts co-operative campaign, 614, 955.
Rhode Island Public Utilities Commission bill to increase powers of, 616.
Ridgway, H. G., 737.
Rivets, heating by electricity. By J. R. Bower (D), 664.
Robertson, W. E., *1452.
Robbins, Walter, *244.
Rochester (N. Y.) Gas & Electric Corporation, organization chart, 496.
Rock-drill steels too short for use reclaimed by welding. By W. T. Ober, *942.
Rocky Mountain Electrical Co-operative League, 1389.
Rocky Mountain Electrical League selects emblem, 113.
Roentgen rays:
Roentgen rays (see also X-ray):
——Transformers, high-tension. By Russell S. Wright (D), 384.
Roentgen rays, transformers, high-tension, for X-ray purposes. By Reginald Morton (D), 440.
Rolling mills:
——Some methods of obtaining adjustable speed with electrically driven rolling mills. By K. A. Pauly (D), 1261.
Rosa, Edward Bennett, 1144.
Ross, H. C., *905.
Ross, H. S., 1394.
Rotary-converter practice. By A. Barjon (D), 1061.
Rotating equipment, ventilating, 806.
Rough, George C., 230.
Rowe, Hartley, 1451.
Rowell, Chester H., 173.
Ruffner, C. S., *849.
Rubber mills favor synchronous motors, 221.
Rubber industry, application of electric power to, (D), 723.
Rubber industry power in, A. I. E. E. meeting, 111.
Rural service:
——Costs, rural and other service compared, 649.
——Extensions of service into rural territory, 620.
——Indiana rules, 214.
——Lines owned by farmers. By C. S. Kennedy, 1243.
——Problems, Indiana Electrical Society, 168.
——Profitable field, says D. L. Gaskill (interview), *1445.
——Rates must cover all costs. By J. O. Kammerman, 189.
——Serving from high-tension lines, *875.
——Unprofitable business, 1097. Comment, 1087.
——Voltages best for rural distribution, 863.
Rutland, C. J., 118.
Ryan, Victor A., 564.
Ryder, Gilbert E., 850.

S

Sadler, Roy, 962.
Safety first, impressing ideas on employees, *609.
Safety, sane versus insane safety. By Kassandra, 1049.
Safety:
——Willful destruction of electrical apparatus a menace, 215.
Salaries: Commission insists on full knowledge of salaries paid by utilities, 1184.
Salem (Mass.) Electric Lighting Company plant, *337.
Sanborn, Robert P., 622.
San Joaquin Light & Power Company:
——Kerckhoff development. By R. C. Starr, *471, *641; Comment, 465.
——Substations, outdoor. By L. J. Moore, *1365.
Santa Fe (N.M.) Water & Light Company, central-station office fits local architecture, 1116.
Sarnoff, David, *1336.
Sawmills, power requirements in, 379.
Sawyer, P. B., 285.
Scheffler, Fred A., *510.
Scientific and industrial research, 163.
Schwab, Mr., exemplifies the beauty of optimism. By Frank W. Chase, 149.
Searchlamps, United States Army. By Chester Lichtenberg (D), 106.
Searchlamps with several light sources. By I. Kiefer (D), 892.
Searchlights: Arcs, high-current, with special reference to searchlights. By J. Paley Zorke (D), 384.
Segur, F. B., 1393.
Semenza, Guido, 849.
Service, central-station:
——Ideal power service from viewpoints of seller and buyer, 952.
——Value of continuous service, 960.
Shannonhouse, G. G., Jr., 1394.
Sharp, John T., Jr., 737.
Shaw, Walter A., 1393.
Shawinigan Water & Power Company issue, 613.
Sheldon Memorial Foundation, 170.
Shepherd, C. H., *1073.
Sherman, Raymond D., 1336.
Ships:
——Diesel-engine electric drive for ocean-going freight ship, 614.
——Electric cableway helps build scout cruisers, 1093.
Ships (Continued):
——Electricity on merchant. By E. D. Dickinson (D), 664.
——Generators for ship propulsion, alternating-current. By E. H. Freiburghouse (D), 384.
——Guiding by submerged cables. By Loth (D), 274.
——Merchant marine searchlamps. By G. E. Young (D), 780.
——Motors, synchronous, for. By E. S. Henningsen (D), 497.
——Tennessee, electrical equipment on, *846.
——Tennessee, navy satisfied with tests, 1446.
——Turbine drive high-speed of merchant ships. By Eskil Berg (D), 665.
——Turbo-generator electric drive, 614.
Shovel, electric, in open-cut mining. By C. R. Fisher and H. G. Head (D), *273.
Show, Kansas City electrical, 59.
Sickels, M. C., *782.
Signal Officer, Chief United States Army, (D), 162.
Silk-mill production aided by applying variable-speed drive to twisters, *886.
Simpson, Frederick G., 850.
Skagit River development, 875.
Skin effect in round conductors. By Breitfeld (D), 218.
Skinner, Herbert H., 962.
Smith, George Oliver, 738.
Smith, Dr. George Otis urges ample coal reserves for utilities, 1330.
Smith, J. Allan, 510.
Smith, Julian C., *1509.
Société Hydrotechnique and its electric map of France, (D), 108.
Society for Electrical Development:
——Attacks underwriters' figures, 277; Comment, 428.
——Expansion (comment), 521.
——Fire Underwriters' figures, attack, 277.
——Goodwin joins, *557.
——New plans, 1141.
——Rebirth. By Earl E. Whitehorne, *1162. Comment 1141.
——Wakeman, J. M. resigns, *1123.
Society for Promotion of Engineering Education forms New England Section, 674.
Soldering tool, electric. By J. H. Mayforth, 714.
Southern California Edison Co.:
——Distributes $6,634,800 of stock in four months, 1438.
——Dividends, increases, 387.
——Expansion program, six-year, 448.
——Issues $10,000,000 in bonds, 221.
——Not to delay construction program, 112.
Southern Idaho Electric Light and Power Users' Association, 1386.
Southern Power Company development hinges on rate increase, 444.
Southwestern Electrical and Gas Association. Discuss power factor and electrical merchandising, 1332.
Spare parts to keep in stock in industrial plant, 1169. By Frederick Krug.
Speed control for paper-mill drive. By Stephen A. Staege, *603.
Spencer, H. N. 1187.
Spoehrer, Herman, *1072.
Sprague, Frank J., to receive Franklin medal, 1124.
Springfield dispute, plan to settle, 331.
Springfield Gas & Electric Company to suspend because of Franchise refusal, 164.
Sproule, Thomas, 677.
Squier, Major-general George O., *509, *976.
Standard Gas & Electric Company, larger construction program for 1009, 1506.
Standardization, international. By Dr. P. G. Agnew, 845.
——Electrical apparatus, basis for standardizing. By E. E. George, 372.
Stanley, R. W., 1509.
Stanton, Robert M., 821.
Statistical:
——Central-station operations, 1317.
——Central-station output, *537.
——Central station output and revenue. November, 226, *315, comment, 297.
——Central-station output of nine electric systems in 1920 exceeded 1,000,000,000 kw-hr. each, 924.
——Central-station output for 1920 was 46,700,000,000 kw.-hr., *45.
——Central-station output for 1920 nearly forty-four billion kilowatt-hour, 618; Comment, 1487.
——Electrical business in 1920. By T. Commerford Martin, 304.
——Electrical industry will require $10,371,000,000 by 1925, *9.
——Industrial load reaches low level, *1046.
——Operating ratio of light and power systems, *766, Comment, 751.
——Output of 27 major companies, 1487.
——States, electrical importance of the, *651.
——Southwestern states, electrical importance of the. By T. H. Arnold, 1048.
Stators, calculation of the mechanical strength. By H. Pistoye, (D), 1174.
Steam station, effect of load factor on costs. By Peter Junkersfeld, *85. Comment, 130.
Stearns, W. G., 62.
Steel, effect of rate of cooling on properties of carbon steel. By C. Nusbaum and W. L. Cheney, (D), 781.
Steel mills (see also Blooming mills and Rolling mills):
——Cost of rolling. By G. E. Stoltz (D), 1494.
——Motors. By W. W. Wood (D), 1497.
Steel-mill frequency problem. By B. G. Lamme, *921. Comment, 918.
Steel-mill power costs distributed on machine-hour basis, 1122.
Steele, H. G., *1186.
Steinmetz, C. P., (comment), 241.
St. Lawrence power, what it means to New England, Harriman tells, 114.
Sticht, C. A., 1187.
Stirling, Charles, 510.
Stokers, chain-grate, maintenance of. By John M. May, 253.
——Remodeling stokers and furnaces adds to capacity. By T. A. March, *196.
Stone, Charles Augustus, *132.
Strickland, H. S., *906.
Strunk, Walter C., 1130.
Substations, automatic:
Submerged insulated wire, current flow around. By O. Oldenberg (D), 162.
Substations:
——Dayton, cost and characteristics of new. By W. Shuler, *374.
——Graphic records show when equipment is overloaded. By G. M. Hardy, 1488.
——Outgoing lines, economical construction. By A. L. Johnston, *207.
——Switch, automatic disconnecting, for small substations Georgia Railway & Power Co., *96.
——11-kv. for oil fields. By S. B. Severson, *830.
Substation, automatic:
——Checking up on By Charles H. Jones. (D), 1061.
——Emergency operation of, 1430.
——For alternating-current railway signal power supply. By H. M. Jacobs. (D), 107.
——Kansas City to have record system, 1126.
——Mine. By Graham Bright, *817.
Substation, outdoor:
——Simplicity in layout. By L. J. Moore, *1365.
Sullivan, J. D., *791.
Summer, M. D., 962.
Sunny, Bernard Edward, 174, 808.
Sunspots, electric and magnetic variations and disturbances. By J. B. Whitehead, 1371.
Superheaters, modern practice. By H. B. Oatley, (D), 138.
Superpower:
——London superpower scheme, 898.
——Mouth-of-mine plants found impracticable for superpower project, 1063.
——New York district, feasibility of hydro-electric power for. By Col. William B. Parsons, *525. Comment, 523.
——Northwest superpower survey committee organized, 1008.
——Plan, legal and financial aspects, *1152.
Superpower Survey:
——Murray declares system must have adequate return, 220.
——National Coal Association slander, Dr. George Otis Smith answers, 450.
——Plants practicable for anthracite regions, says Murray, 1178.
——Program, private initiative not discouraged in, 446.
——Superpower investigations. By W. S. Murray, 27.
Sutherland, A. G., 565.
Swan, Alfred, 173.
Sweden, Electro industry. By Sigurd Halden, (D), 665.
Switches:
——Automatic disconnecting, for small substations Georgia Railway & Power Co., *96.
——Automatic, mounted overhead. By Alex H. May, *322
——Disconnect, and horn gap cut-out. By H. L. Wood, *1429.
——Disconnecting, opened without strain on supports. By George S. Humphrey, *320.
——Grounding, remote hand-operated. By C. C. Robinson, *1486.
——Inclosed fused 2,500-volt, *1492.
——Mechanical forces acting on. By L. B. W. Jolley, (D), 218.
——Oil, accidental closing prevented by spring device. By John E. McCarthy, *1373.
——Oil, overhauling. By F. I. Morgan, *193.
——Oil, protecting, *826 by A. P. Royal.
——Standardized mounting for outdoor switches, coils and fuses. By P. P. Ashworth, *205.
——Switchgear problem in power house. By R. A. Bolton, (D), 216.
——Pintsch "glim" lamp for switch circuits. By Dr. Schroter, (D), 1061.
——Temperatures for switches, buses and bare conductors, Electric Power Club, 49.
Switchboard of record size shipped to South Africa, 674.
Switchboard made of standard parts is compact and safe. By F. W. McGraw, *1259.
Switchboard mounting. By John F. Hanley, *434.
Switch house, new type prevents bus short circuits. By B. G. Jamieson, *761. Comment, 750.
Switzerland:
——American capital to finance electrification, 225.
——American-Swedish electrical commission, 880.
——Plant under a mile head, *529.
——Power stations, winter, 816.
——Railway electrification making fast progress, 1124.
——Water power and adequate electrical supply, 94.
Swittenberg, R. Lee, *792.
Symbols for electrical equipment in buildings, 1066.
Symonds, N. G., *1510.

*Indicates illustrated articles

T

Taxes:
——Exemption of utility securities from federal taxation urged, 1120.
——Indiana utility, to be less, 1506.
——Jobber may be manufacturer under excise tax change, 232.
——New York State tax as it affects outside utilities, 339.
——On a war basis in peace times (Comment), 633.
——Questionnaire submitted to business organizations, 1506
——Raise, California legislature quashes, 335.
Technical and practical men, co-operation of in industry. By Howard D. Matthews, 992.

Telegraphy (see also radio telegraphy):
——Automatic signaling, long-distance. By R. T. King and E. J. Barnes (D), 1499.
——Cables, impedance of submarine. By Douglas C. Gall. (D), 441.
——Conductor-directed radio for interplant communication. B. Gervecke. (D), 218.
——Wisconsin utility rate increased, 11 per cent, 1446.
——Machine. By Arthur James Polley. (D), 1383.
——Paper by A. G. Pierce, 1472.
——Printing, development. By J. O. Carr. (D), 1007.
——Submarine cables. By A. L. Kimball. (D), 781.
——Submarine cable to East Prussia. By E. Muller (D), 1440.
Telephone, Bell, service in 1921, 616.
Telephone companies, play fair with, 861.
Telephony, automatic. By J. H. Reyner. (D), 108.
——Automatic exchange, ringing machine for. By F. P. Dhunjohn. (D), 611.
——Ear telephone, small. By L. Weber. (D), 1328.
——Guided-wave telephony. By Charles A. Culver. (D), 781.
——Lines have no right to monopolize highway, 336.
——Long-distance system of the United Kingdom. By Sir William Noble. (D), 1175.
——Loud-speaking. By Philip R. Coursey. (D), 893.
——Lighting mains, over. By Belleville (D), 329.
——Multiple-harmonic, epoch-making contribution on (comment), 523.
——Railway traffic control by telephone. By T. F. Lee. (D), 1118.
——Tapping circuits during war. By A. Carletti (D), 1499.
——Telegraphy and discussed. By John R. Carson (D), 1499.
——Wireless, recent developments. (D), 274.
Telluride Power Company wants more time to complete Beaver River project, 788.
Temperature limits of large alternators. By Mark Meredith, 710.
Tempering bath, oil, proper care of. By C. T. Hathaway, 212.
Tenney, Charles H. & Company, Boston. Hold sales conference, 663.

Testing:
——Electrical machinery. By H. E. Mellor (D), 1499.
——Laboratory in Germany. (D), 162.
——Loop test for high-resistance faults (D), 554.
——Small equipment, simple board for. By A. H. Platt. *380.
Texas utility act, 841.
——Includes municipal plant regulation, 164.
Textile mills, application of electricity to. By J. T. Randles. (D), 950.
——Continental practice in electric drive, 718.
Tharp, W. J., 62.
Thayer, Harry Bates, *1406.
Thermometers, platinum resistance, construction. By T. S. Sligh. (D), 1175.
Theoretical engineer has important function New York men hold, 1013.
Thornton, Frank, Jr., 119.
Tidal power, France to undertake the development of, 934.
Tidal-hydro-electric scheme, British governments' 500,000-hp., 115.
Tideman, William J., 1073.
Tillman, R. H., *1393.
Timmerman, L. B., 850.
Tin-plate mills, electrically driven. By W. E. Taylor. (D), 162.
Titles for industrial plant electrical men, (comment.), 353.
Todd, J. A., 173.
Tolles, E. Donald, *906.
Towne, Henry R., 1187.

Traction (see also railways):
——Berlin railways. By Wechmann. (D), 553.
——Catenary system, motion phenomena on. By E. Zenlman (D), 1498.
——Diesel-electric motor cars. By Lucien Pahin, 1381.
——One-man safety car. By Harry L. Brown. (D), 553.
——Substantial energy saving on Philadelphia Rapid Transit. (D), 723.
Tractors (see trucks).
Trade, domestic:
——Acceptances, 1337.
——Aluminum conductor bookings show increase, 399.
——Apparatus shipments, 64.
——Appliances, socket, 64, 739, 1020, 1132.
Trade, domestic (Continued):
——Circuit breaker, air, 1270.
——Armored-conductor, flexible 64, 176, 455, 566, 1189.
——Arresters, lightning, 288.
——Arresters, pole-top, deliveries ruling short, 399.
——Brass rods, sheets and tubes, 1270.
——Brushes, 343, 1337.
——Business conditions getting better, 1013.
——Business conditions indicate upward turn, 1131.
——Buyers' market predominates after heavy year, 63.
——Cancellations, causes and remedies, 15.
——Carbon industry needs tariff protection, 794.
——Castings, malleable iron, in easier supply, 343.
——Census report of electrical manufacturers, 1454.
——Collections, leniency may have advantages, 287.
——Collections, St. Louis, 175.
——Conduit, 64, 121, 455, 964.
——Copper, 288. (Also see Trade and Market department in every issue.)
——Costs of materials in buildings analyzed, 1075.
——Cotton, 795, 908.
——Credit, generous foreign, will help domestic business, 241.
——Cross-arms, 343, 679, 963, 1512.
——Efficiency in business to help meet demand for lower prices, 1068.
——Fans, 399, 739.
——Falling market, nothing to fear in a 633.
——Farm-lighting plants, 231, 512.
——Fiber conduit, 679.
——Fixtures, 511.
——Fixtures design, 1019.
——Fixture standardization, 1074.
——"Fixture," wanted, a better name than. By Reginald Trautschold, 937.
——Freight prepayment advocated by supply jobbers, 964.
——Fruitful field for engineer and manufacturer. (Comment), 917.
——Glassware, lighting, 232.
——Grain, 176.
——Hardware, pole-line, 64, 399, 455, 680, 907, 963.
——Heating devices, 1453.
——Hoover outlines aims in commerce dept. 680.
——Insulation, 456, 852
——Insulation manufacturers optimistic, 1454.
——Insulators high-tension, porcelain, 175, 624.
——Lamps, 64, 1074, 1337, 1453.
——Lamp companies on a four-day-week basis, 288.
——Lamp, miniature, new selling plan, 176.
——Line materials, 1019.
——Loom, 120, 1132.
——Malleables, 1511.
——Manufacture, American, virtues and vices of (comment), 1409.
——Manufacturers, outlook favorable for, 793.
——Metal-market situation (see Trade and Market department in every issue).
——Motors, fan, 1396.
——Motor manufacture standardized, 837.
——Motors, washing-machine, standardization, 287
——Meters, 231, 566, 739, 1270.
——New England business shows hopeful signs, 1131.
——Open vs. closed shop, 231.
——Organizations, governments' attitude on, 1389.
——Poles, 624, 907.
——Porcelain, 288.
——Price guaranteeing, 512.
——Price reduction not yet a stimulus to trade, 567.
——Prices on electrical materials, 794.
——Radio manufacturers, 739.
——Radio manufacturers consider plan to organize, 728.
——Ranges, 121, 851.
——Reflectors, industrial, 512.
——Refractories, 851, 1188.
——Refrigeration mechanical, 964.
——Sales of three producers, 1920, total $632,000,000, 851.
——Sales tax, 1512.
——Schedule material, 456, 1271, 1396, 1454.
——Sheets, electrical, 400, 1010.
——Signs, 1189.
——Southwest electrical market shows encouraging activity, 963.
——Steel, 511, 566, 908.
——Stocks, Chicago, need for building up, 1512.
——Supply items, 740.
——Switching equipment, 623.
——Tower market, 1188.
——Trade practices and living costs, 917.
——Transformers, distribution, ten per cent reduction, 455.
——Vacuum-cleaners, 679, 795.
——Washing machines, 399, 795, 1337.
——Wire, 64, 342, 740, 907, 1131, 1395.
——Wiring-material, 64.
Trade, Foreign:
——Appropriations committee approves items in aid of exports, 1329.
——British and United States exports, 287.
——British institution of electrical engineers semi-centennial, 1266.
——British lamp prices, 566.
——British manufacturers active in standardization, 1189.
——Copper, export, financing full of meaning to electrical industry, 455.
——England's future in electrical manufacture, 1395.
Trade, foreign (Continued):
——Exports, April valued at $9,085,598, 1395.
——Exports, February, total $13,632,478, 852.
——Exports, hundred-million mark passed for 1920 electrical, 342.
——Exports, January, $15,332,955 set new high mark, 624.
——Exports, March, total $9,782,045, 1019.
——Exports, November, reach $10,488,628, 175.
——European market will grow with power development, *389.
——Fans, 1511.
——Germans active in regaining foreign trade, 793.
——Germans again undersell export market, 852.
——German producers' reports show high labor, 456.
——Germany and Austria, business situation. By S. Silberstein, 541.
——Germany, motors, 232.
——India, future market for electrical materials, 567.
——Japanese market development expected by summer, 231.
——Lamp, metal-filament, exports, 1188.
——Motor exports, 1074.
——Orient trade pitfalls and possibilities in, 400.
——Russian electric industries at low rate, 740.
——Swiss electrical manufacturers' high production costs, 1271.
——Tariffs, French and Spanish higher, 1453.
——Wire exports for 1920 more than eight million, 623.
——World trade, Calvert Townley suggests new method of stimulating, 1266.

Transformers:
——Air spaces under transformer reduce temperature. By J. J. Luchessa, *1375.
——Dimensions of auto-transformers and boosters. By F. Horschitz. (D), 553.
——Drying out large transformers. By S. H. Abbott. (D), 949.
——Transformers, elecfrostatic. By F. C. Blake (D), 274.
——Heat dissipation in transformers. By M. Vidmar. (D), 892.
——Iron loss of sheet samples. By Thomas Spooner, *91.
——Maintaining. By G. W. Schmauder, 1319.
——Materials required for standard outdoor transformer installation. By F. L. Lovett, *770.
——Oil-filled transformers near inflammable material set in concrete vat. By W. C. Heston, *1321.
——Polarity, subtractive or addition for single-phase units. By C. W. Piper. *258. Comment, 243.
——Quench. (D), *106.
——Room, semi-inclosed allows free air circulation. By G. Wagschal, *153.
——Station for factory yard, *885.
——Three phase, suppression of third harmonic in. By H. Pistoye. (D), 1381.
——220,000-volt, building first. By Clinton Jones, *301, comment, 299.
——220,000-volt and 165,000-volt, *1284.

Transformers, instrument:
——Convenient disconnecting switch for current transformers, *1050.
——Phase errors in. By Goldstein. (D), 274.
——Polarity, testing. By D. A. McNulty, *1372.
——Silk-film device prevents damage to opened current transformer. By R. H. N. Lockyer, *655.
——Standardization wanted by companies. By S. A. Fletcher, 653.
——Testing, new method. By R. S. J. Spilsbury. (D), 781.
——Voltage, errors in how to correct for. By J. B. Gibbs. (D), 498.

Transmission:
——Alternating current lines, determining characteristics by hyperbolic charts. By Blondel & Lavanchy (D), 440.
——Calculations of long-distance high-voltage lines. By A. McKinstry. (D), 53.
——Charts for quick solution of line-drop problems. By E. P. Peck, *1238; correction, 1426; comment, 1208.
——Costs effect of high costs on. By E. B. Meyer, 25.
——Cost estimate for 60,000-volt line. By Paul P. Ashworth, 1048.
——Cost of 66-kv. spur line $6,630 per mile. By C. R. Oliver, 431.
——Costs, pole-line, reduced by unusual construction. By M. T. Crawford, *1373.
——Distribution of electricity. By W. B. Woodhouse. (D), 385.
——Economy, optimum conditions. By Baticle (D), 837.
——Extensions on cross-arm braces support ground wires. By J. J. Luchessa, *995; correction, 1430.
——Equation for long lines (Comment), 523.
——Extension rules for northwest being formulated, 1011.
——French transmission line for 110 kv. By M. A. Henriod, *983.
——Fusing 44,000-volt transformers. By P. P. Ashworth, 261.
——Graphic method for the calculation of high-voltage lines. By W. Koch and W. Maurer (D), 1327.
——Grounding switch for outdoor high-voltage lines. By W. R. Battey, *653.
——High-voltage, in Switzerland. By I. Wyssling (D), 1497.
——High-voltage protection, 246.
——Horns, arcing, tests, 206.
——Insulators, linemen should not try to set all vertical, 262.

*Indicates illustrated articles

Transmission (Continued):
——Insulators, strain, construction reduces tension on *97.
——Iron conductor, Germany's experience unsuccessful, 203.
——Lines vs. freight on coal. By H. L. Wallau, *423.
——Live lines, working on. By T. F. Johnson, Jr., 710.
——Maintenance, eternal vigilance important in. By F. H. Bates, 1363.
——Maintenance of live conductors. By L. J. Moore, 597.
——Mechanical calculation of overhead lines (D), 1117.
——Mechanical construction of high-voltage transmission lines. By H. Kyser (D), 1005.
——Middle West transmission growing (comment), 297.
——Minimizing investment in line construction. By Eugene Carpenter, 1249.
——Paper by E. B. Meyer, 1471.
——Problems of power transmission systems. By J. Biermanns (D), 950.
——Resistance of earth between stations. By L. J. Moore, 1255.
——Sag of heavy high-voltage lines suspended on disk-type insulators. By H. Schenkel. (D), 1061.
——Superpower. By Tröger (D), 273.
——Suspension-insulator lines in rough country. By Murray J. Idail, *812; comment, 807.
——Unbalanced voltage caused by blown fuse and charging current. By B. R. Payne, *711.
——Voltage drop in three-phase transmission lines. By G. Huldschiner (D), 780.
——Voltage regulation on long alternating-current lines. By Thielmans (D), 384.
——Waves, electric, on wires. By A. G. Warren (D), 1498.
——Wooden-pole design. By H. Ott (D), 106.
——Wood-pole structure for incoming and outgoing circuits. By A. L. Johnson, *151.
——220,000-volt, 74.
——220,000-volt discussed by Pacific Coast men, 1387.
——220,000-volt in California. By H. A. Barre and J. P. Jollyman, 21.
——220,000-volt progress. By J. A. Koontz (D), 1498.
——165,000-volt line of Great Western Power Company of California, 899.
——110,000-volt lines in France. By M. A. Henriod, *1353.
Transmitters, arc, uni-wave signaling system. By W. A. Eaton (D), 1175.
Transportation:
——Hauling heavy transformers on mountain road by tractor. By R. C. Starr, *543.
Tripp, Guy Eastman, *2.
Trucks and tractors:
——Call system increases work. By S. R. Howard, 545.
——Care of. By H. S. Rich, 602.
——Development at Hansa-Lloyd Works, Bremen (D), 611.
——Electric trucks for the Berlin suburban lines. By Wechmann (D), 780.
——Industrial, reduce cost of handling, *424.
——Keeping in shape. By H. S. Rich, 489.
——Warehouse and depot service, 644.
True, Charles H., 622.
Turbine practice, British view of, 1143.
Turbines are 79 per cent of steam prime movers, *152.
Turbines:
——Development in practice. By K. Baumann (D), 1497.
——Gas, new (D), 1006.
——Hydraulic, modern. By Frank H. Rogers (D), 949.
——Hydraulic, speed regulations of. By Raymond D. Johnson (D), 1061.
——Oil, lubricating, keeping in condition. By C. H. Bromley (D), 1439.
——Present trend of development. By Lewis F. Moody (D), 950.
——Small, periodic attention will prevent breakdown. By John W. May, 207.
——Steam, improvements in design (D), 1498.
——Troubles are being overcome. By W. L. Abbott, 19.
Tyler, Randolph E., 1130.

U

Union Electric Light & Power Company:
——Sale of preferred stock at par, *607.
——Hell Gate station, *140.
United Engineering Society:
——Elects officers, 388.
——Engineering foundation, 899.
United States Chamber of Commerce, 845.
United States Chamber of Commerce adopts street-railway program, 278.
——Big problems of business outlined, 1009.
——Urges government reorganization, 1442.
Utah Power and Light Company would further develop Bear River, 115.
Utah State Council, 788.

V

Vacuum tube (see also Radio):
——Unilateral conductivity of, having salt electrode. By M. Kimura and J. Nagahata (D), 441.
——Weagant theormionic, calculation of amplification constant. By Alexander Marcus (D), 441.
Valuation:
——Actual vs. reproduction costs in appraisals. By C. Wellington Koiner, 260.
——Actual versus reproduction cost in public utility appraisals. By H. C. Hopson, 936.
——Apportioning valuation of heating and electric utility, 620.
——Appraisals, actual vs. reproduction cost. By C. M. Larsen, 598.
——Appraisals, actual versus reproduction cost. B. C. W. Koiner, 825.
——"Going-concern value," 1268.
——"Good-will" barred out by California commission, 281.
——Life tables and extraordinary replacements. By J. N. Buswell, 768.
——Missouri Association of Public Utilities at Kansas City discusses valuation, 1012.
——North Dakota practice, 284.
——Of public utility properties for rate making. By F. V. Gallaugher, 1104.
——On five-year basis prior to 1916 improper, 339.
——On pre-war costs held confiscatory by federal court, 396.
——Present-reproduction-cost theory criticized, 506.
——Rate of return of public utilities, 1058.
——Relation of depreciation reserve to valuation, 790.
——Reproduction cost new not now a reasonable basis for rates, 1016.
——Tennessee Commission's attitude on valuation, 790.
——United States district court upsets commissions method, 61.
Van der Ley, J. N., 1186.
Van Pelt, R. W., 1187.
Vegetable oil as a power agent (D), 1175.
Vehicles, electric (see also trucks, traction and transportation):
——Baggage handling, electric trucks indispensible in, *1041. Comment, 1031.
——Chicago gaining favor in, *1095.
——Co-operation has helped, how (comment), 353.
——Co-operative association planned, 1503.
——Electric trucks and industrial locomotives (D), 1006.
——Electric trucks, like other vehicles, need care (comment), 186.
——George B. Foster sees big future for electric vehicle in Chicago, 954.
——Luncheon, enthusiastic, *390.
——New Jersey Public Service Company vehicle show, 668, 895, 995.
——New York show successful, 333.
——Revival of interest in electric vehicles, 861.
——Service station, methods used in (D), 162.
——Status of (comment), 297.
Ventilating rotating electric equipment, *374.
Vermont Electrical Association, 844.
——Trucking problems, sees solution of, in use of electric vehicles, 387.
Vibration. By Julius Frith (D), 665.
Victoria, power for Victorian industries (D), 1174.
Vincent, W. G., Jr., *229.
Voltage:
——Distribution of voltage along disk-type insulator chains. By Ch. Dachary and P. Gorce (D), 1005.
——Meter. By George W. Duckett (D), 1382.
——Sparking, English comment on A. I. E. E. rules. By F. W. Peek, 1427.
——Sparking, between spherical electrodes. By Alexander Russell (D), 54.
——Spark-over through air. By W. S. Flight (D), 108, 329.
——Variation and inductive interference, 904.
Von Schlegel, F. Data on operation of Snyder furnace 880.
Von Schon, H. A., 1393.
Voorhees, C. S., 230.
Vose, Frederick P., *174.
Vye, Murton W., *564.

W

Wages, Detroit electricians' controversy, 555.
Wakeman, J. M., resigns from society for electrical development, *1123.
——Testimonial dinner to, 1331.
Wallace, L. W., 1187.
Walcott, Dr. Charles, 174.
Washington, D. C., Great Falls development. By Lansing H. Beach, 57.
Washington Irrigation & Development Co., Priest Rapids, projected development, 139.
Washington Power and Traction properties, steps taken toward merger, 335.
Waste elimination, study well under way, 673.
Waste in industry, national survey of (comment), 465.
Waste, responsibility mostly on management, 1388.
Water, removing gases in, by the Kestner System. By Perdrizet (D), 1005.
Water, flow in concrete pipe lines (D), 781.
Water power:
——Act, New York to test, in course, 386.
——Act, 559 (see also Federal Power Commission).
——Act, personnel amendment, 168.
——Applications (see Federal Power Commission).
——Development, malicious cartoon reflecting on, *393.
——Electrical industry, undeserved reflection on (comment), 353.
——League to hold first annual meeting Jan. 18, 113.
——N. E. L. A. and power commission agree on water-power regulations, 897.
——National parks, how development can add scenic effects in Yosemite Park. By L. J. Moore, 203.
——National parks, public developments in. By J. M. Buswell, 485.
——National parks, waters of, can be used without injury to scenery. By Jerome G. Locke, 372.
——Navigable stream, what constitutes, 1450.
——Navigable streams, which are? 750.
——"Navigable Streams," new interpretation given to the term, 1010. Comment, 979.
——Navigable waters, what are they? 1128.
——New York to defend state's rights in hearing, 169.
——Pennsylvania to hold conferences on, 1502.
——Practice, recent tendencies. By John F. Vaughan, 17.
——Recommends private development of New York water powers, 670.
——Regulations, 840.
——Regulations governing development of water power in Japan, *1101.
——Relation of, to industrial development in California, 1059.
——Situation, tangling up the (comment), 466.
——State development unnecessary, 861.
——State ownership of water powers killed in Maine, 895.
——Storage development recommended in New Hampshire report, 281.
——Storage, state development favored in Maine report, 224.
——Switzerland, water power and adequate electrical supply, 94.
——Tidal power, studies in. By Norman Davey, II (D), 384.
Waterpower developments. By Daniel W. Mead (D), 1498.
Water powers which are beautiful and useful. By W. Glenn Field, 149.
Waterwheel (see also turbine hydraulic):
——Design, advance in. Paper by W. M. White, 1470.
——Design and flow measurement, 278.
——Pit flooded when it became sealed with water. By J. W. Andree, 1374.
——Protecting waterwheels against overspeeding. By J. W. Truesdell, *1107.
——Runnel repaired by electric welding. By J. H. Siegfried, *769.
——Short cut for estimating power of waterwheel. By Ralph McKinney, *995.
——World's highest-rated waterwheel generator, *561.
Watson, James E., 850.
Wave propagation over parallel wires. By John R. Carson (D), 1175.
Webster, Edwin Sibley, *1348.
Weller, Robert C., 850.
Welding, electric-arc (D), 440.
——Applications increase 100 per cent in 1920, 1068.
——Electrodes, desirable qualities in. By C. J. Holslag, 157.
——Foundry, arc-welding equipment in. By W. W. Reddie (D), 950.
——Metallic arc holders. By L. W. Webb (D), 611.
——Metallic electrodes. By William Spraragen, 50.
——Motor maintenance (D), 1006.
——Phenomena of arc welding. By O. H. Eschholz (D), 1062.
——Progress. By Neuberger (D), 838.
——Studding cast-iron welds relieves contraction strains. By C. J. Holslag, *658.
——Tanks, electrically welded, show advantages over riveted ones. By William Schenstrom, *1377.
——Testing welds. By F. M. Farmer (D), 951.
——With two arcs in series. By C. A. Bourgeois (D), 1006.
Welding, electro-percussive, *367.
Western Association of Electrical Inspectors, 58.
——Grounding secondaries, discuss, 276.
——Oil fire, hazard of, discuss, 167.
Western Electric Company, 1920 sales $206,112,000, 729.
Westinghouse sales amount to $151,000,000, 1179.
Western States Gas & Electric Company plans additions, 1390.
West Penn Power Company, generating system. By G. G. Bell (D), 1439.
Westport station, modern tendencies in. By M. D. Eagle, 255.
Whaling, T. G., 850.
Wheeler, N. B., *229.

*Indicates illustrated articles

Whitehorne, Earl E., *1120.
Whiting, C. W., 1130, 1186.
Whitman, Ezra B., *906.
Whitney, Dr. W. R., 285, 636.
Widener, Carl C., 737.
Wilkins, Frederick Hayes, 1187.
Williams, Arthur, *188.
Williams, Harrison, 1336.
Williams, H. W., 621.
Wills, H. L., *961.
Williams, L. C., *906.
William, Paul F., *509.
Wilson, Robert B. M., 1394.
Wind, points to consider in using as a source of power. By Paul Basiaux (D), 1061.
Winders, electrical. By J. Kirkwood (D), 1498.
Wiring:
——Conduit and wiring tables aid wiremen. By A. G. Humphrey, 385, comment, 1258.
——Diagrams, easy plan for teaching men to read, 100.
——House, growth featured at Boston show, *1436.
——House-wiring costs, *701.
——How 3,000 southern homes were wired. By L. J. Wilhoite, *645. Comment, 635.
Wiring (Continued):
——Interior, application of demand factor to, 98.
Wiring, why not fixed prices for? By Kassandra, 1114. Comment, 1085.
Wire and cable literature, units for, 1122.
Wire (see also Trade, Domestic):
——Insulated-, specifications, to unify, 448.
——Iron conductor, shall it be used? (comment), 466.
Wires, equilibrium of suspended. By W. Jetter (D), 328.
Wireless (see also Radio):
——High-power station at Nauen. By Felix Linke (D), 839.
——Signals, Morse printing. By B. S. T. Wallace (D), 839.
Wisconsin Electrical Association:
——Convention, rate factors to be discussed, 448, 727.
Wisconsin Railroad Commission:
——Municipalities support, 1177.
Wishon, A. E., *118.
Witherspoon, R. H., 1394.
Wood, Douglass, 1073.
Wood, E. J., 1394.
Wood, Frank A., 1072.
Worcester (Mass.) Electric Light Company suffers slight fire loss, 220.
Worcester load center, 475, Comment, 467.

X

X-ray:
——Apparatus for work shop, 1382.
——Crystal analysis of metals. By Albert W. Hull (D), 1382.
——Examination of materials. By J. R. Clarke (D), 950.
——Industrial application (D), 1261.
——Industrial applications. By C. W. C. Kaye (D), 1382.
——Machines, 61.
——Testing materials. By A. P. McFleuring and J. R. Clarke (D), 553.

Y

Yates, William G., *1187.
Yerger, C. W., 174.
Young, C. M., 565.
Young, Owen D., 1269.

Z

Zinc plant of the Anaconda Copper Mining Company at Great Falls, Mont. (D), 724.

*Indicates illustrated articles

AUTHOR INDEX

A

ABBOTT, N. L. Troubles with large turbines are being overcome, 19.
Agnew, Dr. P. G. Standardization, international, 845.
Alger, P. E. Resistance box for testing ammeters, *262.
Anctil, Amédée. Drying out motors and generators, *606.
Anderson, Earl A. Illumination design simplified, *416, comment, 410.
Andree, J. W. Air bound in penstock reduced output, 711.
——Motor on waterwheel-driven exciter saves power and shutdowns, *771.
——Waterwheel pit flooded when it became sealed with water, 1374.
Arana, Victor M. Wide variation of resistance obtained with three switches, *325.
——Shop method for low-voltage measurement, *997.
Arnett, W. W., Jr. Maximum demand, tables for estimating, 1172.
Arnold, T. H. Handling heavy mine cable installation, 887.
——Lighting for dusty places, 768.
——Selecting electric locomotives for metal mines, *209.
——Southwestern states, electrical importance of the, 1048.
Ashworth, Paul P. Cost estimate for 60,000-volt line, 1048.
——Estimating peak load on distribution transformers, 1108.
——Fusing 44,000-volt transformers, 261.
——Standardized mountings for outdoor switches, coils and fuses, *205.
Atchinson, Walter B. Flexible couplings, *435.
——Home-made come-along for drawing motor pinions, *50.
Auty, Clarence. Simple improvement in truck-battery charging saves $36 a year, *1053.
Avera, A. U. Strain-type 12,000-volt choke coil built on job, *261.

B

BAILEY, B. F. Too small a pulley caused bearing to burn out, 997.
Bailey, Raymond. Relay tests and inspection, *809. Comment, 806.
——Testing reverse-power relays without removing leads, *319.
Ballard, R. H. Automatic financing, 10.
——Financing hundred thousand people to help finance 900,000-hp. project, interview, 842.
——"The people's project"—an address, 777.
Barre, H. A. and J. P. Jollyman. Transmission at 220,000 volts in California, 21.
Barstow, W. S. Common stock the basis of financing, 305.
Bates, F. H. Eternal vigilance important in maintenance, 1363.
Battey, W. R. Grounding switch for outdoor high-voltage lines, *655.
Beach, L. H. Great Falls development, 51.
Beaty, L. C. Vibration from two air compressors eliminated by balancing, 212.
Bell, Louis. Illumination, unsymmetrical, 652.
——Mirrors, preservation of laboratory, 1165.
Belt, T. A. E. Operating results of a 1,500-kva. automatic hydro station, 1235.
Bernholz, Philip G. Small motors made to run at synchronous speed, *1376.
Blackburn, L. A. Compact panel box for three-phase branch circuits, *211.
Blackwell, W. P. (See Dows, Chester L.)
Blakeslee, D. W. How often should lighting fixtures be cleaned, 941.
——Automatic controller operates blooming-mill lift tables successfully, 377.
——Lighting units, calculating the size, 660.
——Lighting system design must consider cost of cleaning fixtures, 772.
——Motor shaft end welded without removing winding, 830.
Bogard, G. T. Tracing the unaccounted for losses in distribution systems, 1248.
Bragdon, E. L. Method of supporting vertical run of very heavy bus, *1435.
Brandon, E. T. J. Queenston-Chippawa development, *697. Comment, 691.
Broome, Frank H. Rheostat, barrel 1,600 amp. at 125 volts, *827.
Brusster, James F. Furnace, brass operating records of, 49.
Burhoe, L. N. Close inspection insures good service, *774.
Burns, H. L. Ceiling mounting for large compensators, *435.
——Frame for mounting compensator, *604.
——Motor-record system for plant with several departments, *49.
Burton, H. J. Fire prevention in electrical stations, 1166.
——Interconnecting small plants, 1239.
——Rules to be followed while working around boilers and stokers, 940.
Buswell, J. N. Life tables and extraordinary replacements, 768.
——Need for information on treatment of electrical burns and shock, 1104.
——Water power development in public parks, 485.

C

CADY, F. F. Errors in photometric sphere, 1368.
Carpenter, Eugene. Miminizing investment in line construction, 1249.
——Motor drive for compressor, *432.
——Weatherproof compact motor mountings on conveyor, *376.
Carpenter, James W. Electric heat raises enameling output, *873.
Challis, J. B. Canada shows rapid hydro development, *931.
Chase, Frank W. Mr. Schwab exemplifies the beauty of optimism, 149.
Clark, A. B. Boiler, good fireman, 826.
——Condenser size and type required for small plants, 1052.
——Economical size of generator, 881.
——Small turbines versus electric motors for power-plant auxiliaries, 939.
Cobb, B. C. Consumers' Power Company does not think straight rates are better than combination, 541.
Collier, Charles A. Handling customers' orders, *437.
Cone, D. I. Interference, inductive, 825.
Connell, E. L. Drills, electric, operating and maintaining portable, 1109.
——Drills, obtaining good performance, 1001.
Conwell, R. N. Tendencies in relay protection, 255. Comment, 242.
Cory, C. L. Engineering education in our universities, 485.
Crawford, M. T. Unusual construction greatly reduces costs of pole line, *1373.
Crosby, Edwin L. Non-ferrous furnaces becoming popular, 37.

D

DANIELS, F. H. Banking vs. oil burner losses, 196.
Daniels, R. S. Gate-opening indicator made in station, *150.
Davis, N. S. How to clean a dirty motor before repairing, 547.
Davidson, F. E. Nebraska Power Company's inspection tours improve public relations, *1173.
Dean, John S. Procedure to follow in dipping and baking armatures, *1055.
——Requirements of insulating material in motor service, *1433.
Debman, E. R. Halving a motor's voltage in a difficult case, *1110.
——Air hammer forces out impregnated coils, *1493.
——Welding loose end rings on squirrel-cage rotors, *999.
De Forest, Lee. Radio telephone, "Broadcasting" news by, 936.
Dellinger, J. H. Radio telephony, long distance now practicable, 142. Comment, 130.
Del Mar, W. A. Increasing cable ratings, 33.
Dixon, A. J. Pilot lamp indicates operation of pumps, *606.
Dixon, James. Commutation trouble causes, 435.
——Correct filing of motor inspection records, 321.
——Cost of motor includes breakdown expense, 208.
——Desirable mechanical features of electric machines, 376.
——Good parallel operation of alternators, 431.
——Repair shop may be likened to a hospital, 493.
Doane, S. E. Illumination, industrial, behind lamp development, *37.
Dows, Chester L., E. B. Fox and W. P. Blackwell. Lighting for dusty places, 191. Comment 187.
Doyle, E. D. Correcting wattmeter readings for phase-angle errors, *314.
D'Oyly, Edward. Dense irrigation load in California, *1241.
Drake, C. W. Synchronous motors for raising power factor of industrial plant, 659.
Driver, J. L. (interview). European markets will grow, *389.
Duncan, R. D. Radio, wired, load characteristics, 1164.

E

EDDY, H. F. Steam leakage through 0.001-sq.in. hole wastes $40 per year, 47.
Eltringham, Robert L. Safety Code Administration, 317.
Engle, M. D. Baltimore coal-handling method, *133. Comment, 132.
——Modern practice in Westport station design, 255.
Evans, S. E. Outdoor meter installation for suburban customers, *994.

F

FARR, W. H. Speed of small motors determined by rotating-disk comparison, *1057.
Flagg, S. B. Maintenance of generating plant, *827.
——Maintenance organization for a 35,000-kva. plant, *713.
Fletcher, S. A. Arresters needed on low-tension bus of power customers, 713.
——Cover should be on meter while testing, 601.
——Meter leads standardization is desired, 769.
——One meter measures total power on two buses, *1265.
——Transformers, instrument, companies want standardization, 653.
Flood, Henry, Jr. Operating costs of small, medium and superpower plants, *1232.
Ford, Arthur H. Measuring the resistance of transfomer grounds, *1106.
Foss, W. L. (see Jordan, A. F.).
Fox, E. B. (see Dows, Chester L.).
Francis, Leroy A. Making generator voltage build up, *1372.
Fuchs, John O. Checking efficiency of generating plants, *521.

G

GALLAUGHER, F. V. Valuation of public utilities properties for rate making, 1104.
Gaskill, D. L. Profitable field in rural lines (interview), *1445.
Gaskin, I. H. Lighting unit with switch mounted on shade, *98.
Gay, F. W. Baking partially rewound armatures and fields, 602.
——Locating submerged motor conductors, *829.
——Kick method of testing coils for polarity, *716.

*Indicates illustrated

Gay, F. W. (Continued):
——Locating solid ground in armature, *775.
——Reversed coils, kick method of locating, *884.
Geissel, H. L. Bavarian water powers, 1164.
——Electrical service in Argentina, 485.
——Electric heating system on Swiss railroads, 1485.
——Italian industries show rapid growth, 428.
George, E. E. Basis for standardizing electrical apparatus, 372.
——Starting synchronous motors under load, 198.
Geyer, A. N. Relays, improved testing of reverse-power, 940.
Golsan, Page. Value of notching poles before treatment with preservative, 1108.
Gooding, R. F. Applying relays to large power systems, *1421. Comment 1409.
——Relay selection for large power systems, *987.
Greenidge, C. A. How a boiler room can improve quality of service, 994.
——Instruments and records for boiler and engine rooms, 938.
——Reducing boiler-room losses, 599.
Gruenhut, A. (See J. Seidener.) Distribution voltages in Switzerland, *463.

H

HALE, R. S. Interconnection, power-contract principles, 4.
Hamilton, W. M. Citizen appointed custodians of street lights, 1060.
Hammock, R. A. Fuse block, sectionalizing, *95.
——Mounting lighting arresters close to transformers, *375.
——Pole stubbing, cheap and effective, *711.
Hanley, John F. Mounting switchboard, *434.
Hardy, G. M. Curves help management, *1167.
——Curves showing men employed and labor cost aid management, *996.
——Graphic records show when equipment is overloaded, 1488.
——Graphic reports, *828.
Harris, W. A. Device to prevent operators' hands being caught in press, *321.
Hathaway, C. T. Care of electrically heated oil tempering bath, 212.
Hayner, D. Eldon. Method of distributing power, *1489.
Heath, A. L. Brush and commutator trouble prevented, 1376.
——Brushes, proper fit and correct pressure help commutation, 1111.
Heidrich, H. C. Routing storage batteries through repair shop, *831.
Hellmund, R. E. Temperature rise with short-time loads, 707.
Hemphill, William. Pushing a large cable through a long duct, 1167.
Henderson, J. H. How to open a storage-battery cell, *1257.
——Locating a very small leak in a storage battery jar, 1375.
Henriod, M. A. French transmission line for 110 kv., *983.
——Substation for 110-kv. lines in France, *1355.
Henton, S. C. Meter polyphase on three-wire single-phase loads, *151.
——Single-phase meters on three-phase service, *712. Correction *1486.
Hervey, A. Eliminating brush trouble on 500-volt motor, 1435.
——Repairing a grounded and poorly soldered armature, 322.
——Repulsion-induction motor, determining rotation of, *154.
——Rotors, squirrel-cage repairing, 832.
Herzog, H. O. Current leakages detected by receiver connected to metal shoes, 996.
——New process for reclaiming coal from combustion residue, *486.
Heston, W. C. Lumber stacker decreases cost of handling lumber, *1113.
——Oil-filled transformers near inflammable material set in concrete vat, *1321.
Hibben, Samuel G. Mounting a lighting reflector out of the way of cranes, *321.
——Safe lighting fixtures for powder plants and munition houses, *268.
——Support for adjustable local lighting, *549.
Hinson, N. B. Fishing cable with compressed air, 1167.
Holslag, C. J. Electrodes, welding, desirable qualities in, 157.
——Studding cast-iron welds relieves contraction strains, *658.
Hood, S. B. Cable ducts lowered without service interruption, *542.
Hood, S. B. (Continued):
——Distribution systems need more expert attention, *1244.
——System neutral as return decreases cost of street lighting, 1167.
Hopson, H. C. Actual versus reproduction cost in public utility appraisals, 936.
Horstmann, Henry C., and Victor H. Tousley. Use of several conductors in one conduit reduces current capacity, *1099.
Hosmer, C. I. Economical use of flashboard supports on a curved dam, 1051.
Housley, J. Elmer. Mortor requirements for meeting unusual service conditions 1112.
Howard, S. R. Call system increases work of industrial tractors, 545.
Humphrey, A. G. Conduit and wiring tables aid wiremen, 885.
——Costs, job order records check, *829.
——Machine and motor records aid speedy repairs, *776.
Humphrey, George S. Disconnecting switch opened with strain on supports, *320.
Hurley, Edward N. Arrested development of public utilities, *1037. Comment, 1030.

I

IDAIL, MURRAY J. Suspension-insulator lines in rough country, *812.
Iler, G. A. Maintenance handled in central shop on southern system, 1237.
Ilsley, L. C. State regulations on the use of electricity in coal mines increasing, *763. Comment, 751.
Insull, Martin J. Public Utility Outlook, 3.

J

JAMIESON, B. G. Switch house, new type, prevents bus short circuits, *761. Comment, 750.
Johnson, C. A. Threaded-in chain winding replaced by formed coils, *1323.
Johnson, T. F., Jr. Live lines, working an, 710.
Johnston, A. L. Economical construction for outgoing lines, *207.
——Regular meter inspection as money saver, *1424. Comment, 1408.
——Wood-pole structure for incoming and outgoing circuits, *151.
Jollyman, J. P. (see Barre, H. A.).
Jones, B. M. Blooming mill, electric drive replaces seam, *715.
Jones, Clinton. Building first 220-000-volt transformers, *301. Comment, 299.
Jordan, A. F. and W. L. Foss. Plug board for primary-line switching control, *1106.
Junkersfeld, Peter. Power, stations tendencies in the design of, *5.
——Steam stations effect of load factor on costs, *85. Comment, 130.

K

KAISERMAN, J. R. Direct billing by meter readers cuts cost, 1251.
Kammerman, J. O. Rural rates must cover all costs, 189.
Kartak, F. A. Testing for phase rotation in three-phase circuits, *928.
Kassandra. Depreciation, amortization, obsolescence and similar topics, 103.
——Wiring why not fixed prices for? 1114. Comment, 1085.
——Safety sane verses insane safety, 1049.
Kemmish, N. A. Unit basis for wholesale and retail rates, 425. Comment 465.
Kemp, A. N. Tendencies in utility financing, 985.
Kennedy, C. S. Rural lines owned by farmers, 1243.
Kennedy, S. M. Transforming public opinion, 1230.
Kennelly, A. E. Electromagnetic theory is fundamental, 29.
King, Mathew. Cause of fires not accurately reported, 825.
King, R. P. Inspection form for large motors, *436.
Kinney, C. W. Diagrams to assist in illumination calculations, *489.
Kirk, R. L. Sealing Cable within motor terminal box, *1490.
Kochs, Albert. Individual drive with motor mounted separate from machine, *490.
Koiner, C. Wellington. Actual vs. reproduction costs in appraisals, 260.
——Appraisals, actual versus reproduction cost, 825.
Kouwenhouven, W. B. Meter connections, checking, 768.
Krug, Frederick. Spare parts to keep in stock in industrial plant, 1169.

L

LAMME, B. G. Steel-mill frequency problem, *921, Comment, 918.
Lane, W. G. Motor drive for oil-well drilling becoming standardized, *155.
Langdell, J. C. Simplifying meter maintenance, *249.
——Need of better protection against improper fusing, 1485.
——Motor selection for oil-well pumping, *323.
Larkin, J. Grounding low-voltage secondaries, 1105.
Larsen, C. N. Appraisals, actual vs. reproduction cost, 597.
Learned, E. D. Drafting room illumination, *714.
Lewis, Warren B. Co-operation between central stations and isolated plants.
Little, B. W. Mail collection of consumers' bills in scattered territory, 1253. Comment, 1209.
Locke, D. J. Fresh-water rheostat handles 900 kw. at 4,000 volts, *1428.
Locke, Jerome G. Waters of national parks can be used without injury to their scenery, 372.
Lockyer, R. H. N. Adjustable home-made coil puller, *548.
——Air brush made from old torch for applying insulating paint, *772.
——Busbar bender which does quick and effective work, 1112.
——Commutators tool rest for turning, *656.
——Expanding metal rings, *718.
——Motors with short-circuited slip rings will not start, 268.
——Reactors reduce current unbalance in leads, *433.
——Removing dust from, building when blowing out generators, *1428.
——Silk-film device prevents damage to opened current transformer, *655.
——Sliding base prevents breakage of insulator, *601.
——Slotting machine for undercutting mica, *1170.
——Soldering large commutators by electric arc, *376.
——Telephone noises reduced by double overhead ground wire, *544.
——Troubles prevented in electric precipitation plant, *493.
Lovett, F. L. Materials required for standard outdoor transformer installation, 770.
Lovett, Israel. Architects' plans should provide adequate convenience outlets, 1370.
Lowry, R. S. Spot lamp for traveling cranes, *1431.
Loyd, R. W. Gate-opening indicator used for indicating kilowatts, *1051.
Luchessa, J. J. Air spaces under transformers reduce temperature, *1375.
——Extensions on cross-arm braces support ground wires *995. Correction, 1130

M

MAGNUSON, A. H. Homemade swinging reflector arm for safe maintenance, *379.
——Waterproof anchorage for roof cables, 660.
March, F. O. Utilities should educate investors on their securities, 1426.
Markwart, A. H. Half million horsepower from Pit River, *581, comment 579.
Marsh, T. A. Remodeling stokers and boilers adds to capacity, *196.
Martin, T. Commerford. Review of electrical business in 1920, 304.
Matthews, Howard D. Technical and practical men co-operation of in industry, 992.
May, Alex. H. Automatic compensator mounted on lathe, *208.
——Automatic switches mounted overhead, *322.
May, John W. Instructions for inspecting and cleaning boilers, 318.
——Keeping a generating station in good condition, 1256.
——Maintenance of chain-grate stokers, 253.
——Maintenance of feed-water pumps, 543.
——Periodic attention to small turbines will prevent shutdown, 202.

*Indicates illustrated articles

Mayforth, J. H. Soldering tool, electric, 714.
McAllister, A. S. Graphical calculations of alternating current circuits, *1359.
McCarthy, John E. Accidental closing of oil switch prevented by contact device, *1373.
McClintock, C. H. Simple methods of economical operation, 1481.
McDonald, A. R. Dampness causes burned-out motor coils and belt slippage, *1168.
McDowell, Commander C. S. Electrifying facilitates port operation, *365.
McGraw, F. W. Switchboard made of standard parts is compact and safe, *1259.
McKinney, Ralph.—Short cut for estimating power of waterwheel, *995.
——Simplified diagrams of motor connections, *208.
McNulty, D. A. Effective street-light switch, *1050.
——Testing polarity of instrument transformers, *1372.
Melia, Martin. Battery jars, breaking avoided, *714.
——Scrap value of old batteries, *888.
Meredith, Mark. Temperature limits of large alternators, 710.
Meyer, A. A. Connecting overhead circuits to underground cables, *1151.
Meyer, E. B. Effect of high costs on transmission and distribution, 25.
Millan, Walter H. Floor hooks facilitate movement of apparatus, *320.
Moore, L. J. Auxiliary transformer reduces inductive interference, *257.
——How water-power development can add scenic effects in Yosemite Park, 203.
——Maintenance of live conductors, 597.
——Resistance of earth between stations, 1255.
——Simplicity in outdoor substation layout, *1365.
Morgan, F. I. Oil switch overhauling, *193.
Morgan, Fred. Industrial distribution methods compared *245, comment, 242.
Morris, Shiras. (Interview) Electrical industry fundamentally sound, 1386.
Mundorff, R. J. Four-pole rack for river span, *318.
Murray, W. S. Superpower investigations, 27.
——Superpower plants practicable for anthracite regions, 1178.
Myers, D. S. High intensity improves sewing-machine lighting, *1054.

N

NAF, THOMAS. Neat and economical large-conduit terminal, *1432.
Neiswanger, E. B. Making the partnership between utilities and consumers a harmonious one, 1165.
Nordfeldt, Bieger. Supplying direct current to slip rings of induction motor, 936.

O

OBATA, DR. JUICHI. Manganin, influence of iron on the temperature coefficient of, 993.
Ober, W. T. Rock drill steels too short for use reclaimed by welding, *942.
Oliver, C. R., 66-kv. spur line cost $6,630 per mile, 431.

P

PAGE, ROY. Instruments indispensable for boiler room economy, *1234.
Pahin, Lucien. Making best use of French hydro plant, 357, comment, 355.
Parsons, William Barclay. Feasibility of hydro-electric power for New York district, *525, comment, 523.
Payne, B. R. Meters, speedy testing, *47.
——Unbalanced voltage caused by blown fuse and charging current, *711.
Peck, E. P. Charts for quick solution of line-drop problems, *1238, correction, 1426, comment, 1208.
Peek, F. W. Analysis of English investigator's comment on A. I. E. E. rules, 1427.
Perley, Frank G. Wire sizes for lines feeding induction motors, 1258.
Perry, James A. Interest of public in utility development, 1379.
Peterman, L. C. Uniform service and meter wiring, *359, comment, 355.
Pierce, Dana. Fuses, refilling, is hazardous, 992.
Piper, C. W. Subtractive or additive polarity for single-phase units, *258.
Platt, A. H. Simple board for testing small equipment, *380.
Powell, E. B. Design of relay power stations, *637, comment, 639.
Powel, Harford, Jr. The public viewpoint, 1353.

Q

QUINNAN, G. E. Apportioning power costs among various classes of customers, 1494.

R

RALSTON, F. C. Condenser tubes, sand-blasting, 95.
——Improvised forced lubrication prevents blower breakdown, 319.
Read, Norman. Growth to come through public information, 1225.
Reibert, Fred A. Cell tester for taking voltage readings with one hand, *1322.
——Edison cells, revolving box for prolonging life of, *1169.
——Treating an Edison battery that has decreased output, 1431.
Reid, C. R. Repairing mica-insulated generator coils, *1487.
Reisz, Charles T. Effect of static discharge on telephone, telegraph and power circuits, 993.
Reyneau, P. O. Distribution, economics of, *79, comment, 73 and 131.
Rice, Theodore H. Card records for distribution poles, *939.
——Distribution losses which may be eliminated, *654.
——Distribution map easy to revise, *826.
——Ground wire should have low resistance and reactance, 883.
——Periodic inspection of services, 1166.
——Secondary networks, numerous advantages, 769.
Rich, H. S. Care of shop tractor, 602.
——Conpensator, careful inspection, 1168.
——Emergency mounting for motors, *546.
——Fuses, refilling inclosed, 829.
——Keeping shop tractor in shape, 489.
——Lamp mounting which withstands high temperature, *997.
——Lighting for core room, 884.
——Motor bearings and oil must be watched closely, 1258.
——Neat starter brackets of strap iron or pipe, *1324.
——Non-reversible attachment plug for three-phase motor, 1110.
——Pump motor mounted above floor to prevent burn-outs, 156.
——Pilot lamp to indicate when service is cut off, *380.
——Rugged attachment plug, *658.
Rich, M. J. Additional switch saves running contacts on starter, *1493.
Richards, W. E. Temperature of cable ducts reduced by blower in manhole, *487.
Ritchey, J. C. Lighting fixture detachable reduces cleaning expense, *833.
Ritter, Ralph W. Locating battery troubles with high-rate discharge test, 998.
Robertson, J. H. Street-lamp burn-outs prevented by relay scheme, *995.
Robinson, C. C. Space saved and troubles reduced by design of choke coil, *1052.
——Remote hand-operated grounding switch, *1486.
Roddey, M. M. Authority and duties of load dispatcher, 430.
Rodhe, Olof. CO_2 and combustible gases should be watched, 712.
——CO_2 percentage not final test of good combustion, 429.
——Kinds of chimney losses and their importance, *544.
Roe, A. C. Halving voltage on a wave-wound induction motor, *717.
——Increasing speed and horsepower of a slip-ring induction motor, *99.
——Overheatings of improperly connected series a.c. motor, *432.
——Tool for driving out tight wedges, *656.
Royal, A. P. Protecting oil switches, *826.
Rudin, Albert. Power-factor correction charts to solve problems, 101. Correction 436.
Rush, Harry S. Meter connected in neutral wire registers incorrectly, *205.
Rush, Harry S. (Continued):
——Speed variation of slip-ring motor due to faulty secondary fuse, 325.
Russell, Charles J. How should power factor be handled, *1089.
Ryan, H. J. Insulator progress in 1920, *31.

S

SAMUELS, M. M. Rating and reliability of apparatus increasing, 23.
Schenstrom, William. Electrically welded tanks show advantages over riveted ones, *1377.
Schmid, M. H. Operating records of furnaces refining steel, *605.
Schmauder, G. W. Transformers, maintaining, 1319.
Schou, Theo. Design data for choosing synchronous machines, *1033.
——Synchronous machines, data for estimating weights of, *1160, comment, 1142.
Schuck, G. R. Locating a grounded evil in an alternator, 263.
Schwabe, Walter P. Organizing for efficient operation, 1229.
Scott, Wirt S. Unusual industrial heating developments, *307.
Seelye, H. P. (see P. O. Reyneau).
——Value of interconnecting isolated and central station questionable, 824.
Seese, R. S. Meter readers can create or destroy good will, 1252.
Seidener, J. Power possibilities in Austria, 310.
Severson, S. B. Substations, 11-kv. for oil fields, *830.
Sheinaus, A. Filler indicates when proper level is reached, *774.
——Preventing burn-out of still used for storage battery water, *944.
——Tank for watering batteries made from old jar, 1109.
Shuler, W. Cost and characteristics of new Dayton substation, 374.
Shute, J. E. A practical method of rating central station employees, *946.
Siegfried, J. H. Waterwheel runner repaired by electric welding, *769.
Silberstein, S. Business situation of Germany and Austria, 541.
Sindeband, M. L. Power-factor rate that works both ways, 1369.
Smith, Frank Whitney, *580.
Soete, Frank. Quickly winding a small armature, *1054.
——Support for bar-to-bar test on small armatures, *943.
Spraragen, William. Welding with metallic electrodes, 50.
Stack, George H. Employee-investors build thrift and good will, 269.
Staege, S. A. Speed control for paper mill, *602.
Stafford, H. E. Distributing power costs in a pulp mill using 1,500 hp., 1000.
——50-ton sulphite paper mill requires 1,500 hp. in motors, *265.
Starker, C. W.—Study of ratings makes possible reduction in number of motor sizes, 774.
Starr, R. C. Hauling transformer cases on mountain road by caterpillar tractor, *543.
——Hydro-electric plant built in 15 months, *471, comment, 465.
——Kerckhoff development of San Joaquin Light & Power Company, *641.
——Penstock hauling heavy sections up mountain roads, *653.
Stillwell, Lewis Buckley, *524.
Stoddard, Herbert G. Bending large cable to fit close quarters, 268.
Stone, E. C. Interconnection limitations, 990.
Stucke, Lyman George. Hydro-electric construction in Italy, 1048.
Sweet, Arthur J. Ornamental street lighting, *1247, comment, 1208.
Swoboda, H. O. Properties of resistor materials used for heating purposes, 944.

T

TATEM, W. E. Use of 220-volt alternator for delivering 110-volt energy, *378.
Thomas, Halbert R. Checking meter connections, 1105.
——Meter installation which permits easy check on connections, *488.
——Standardized meter test board, *429.

*Indicates illustrated articles

Thomas, J. S. Localized blower improves working conditions, *945.
——Mounting motors, *595.
Thomson, William. Changing 60-cycle motor for 40-cycle operation, 1321.
——Judging temperature of motors by feeling with hand, 1378.
——Utilizing "dead" coils in motor for emergency repair, 1257.
Throop, A. T. Improvement of interconnection by liberal co-operation, 202.
Todd, W. B. How far to carry industrial metering, *469.
Tolcik, John A. Inexpensive electric etching pencil, *942.
——Lamp and bracket for punch presses, *657.
——Punch presses, practical bracket and lamp for, *657.
Toman, Orville R. How central stations can popularize radio.
Tousley, Victor H., see Henry C. Horstman.
Tracy, J. H. Calculating battery sizes for locomotives, *1417, comment, 1407.
Trautschold, Reginald. Fires, electric, only 2.57 per cent of all, *693, comment, 690.
——"Fixture," wanted, a better name than, 937.
Truesdell, J. W. Protecting waterwheels against overspeeding, *1107.
Tuck, Davis. Small portable photometer shows accuracy, *476.
Tuthill, J. S. Economies in handling materials in industrial plant, *201 comment, 187.

V

VAN DREZER, S. R. Curve-drawing thermometer to study insulating failures, 1050.
Van Drezer, S. R. (Continued):
——Records show life of suspension insulators, *1429.
Vanleer, Blake R. Valve, hydraulically operated, *48.
Vaughan, J. F. Recent tendencies in waterpower design, 17.
Verney, A. E. Peg board to locate electrician, *436.

W

WAGSCHAL, G. Transformer room, semi-inclosed allows free air circulation, *153.
Wallau, H. L. Selecting oil circuit breakers, 252, comment, 242.
——Transmission lines vs. freight on coal, *423.
Walworth, S. L. Resistance of graphite, 137.
Warner, R. G. New viewpoint on induction motor diagram, *980, comment, 1369.
Warsaw, Charles E. Calculating alternating-current voltage drop, 263.
Wegman, Carl A. Size of fuses to use for distribution transformers, *486.
Westbrook, F. A. Power distribution over aerial cables, *1411.
White, H. H. Efficiencies of low-head plants, 316.
Whitehead, J. B. Electric and magnetic disturbances, 1371.
Whitehorne, Earl E. Society for Electrical Development, rebirth, *1162, comment, 1141.
Whiting, Percy H. Sale of securities, 1226.
Wilder, Willard S. Demand meters, selection of, *877.
Wilhoite, L. J. How 3,000 southern homes were wired, *645 and *820, comment, 635.
Williams, W. H. Clamp eliminates soldering on splices and dead-ends, *488.
Wolf, Herbert J. Shield for protecting drop cable of crane magnet, 1259.
Wood, H. L. Fused horn-gap cut-out and switch, *1429.
Wood, L. E. Block for insulating costs before placing in motor, *264.
Wood, R. J. C. Determining salt concentration at which boilers start priming, 373.
——Too low salt concentration in boilers is not economical, 262.
Wood, W. B. Switchbard lighting, *602.
Woolson, Ira H. Fire losses and electricity, 709.

Y

YAMBERT, D. W. Portable rack for supporting outdoor motor circuits, *941
Young, C. E. Standard outdoor metering equipment, 882.

Z

ZEHME, E. C. Status of foreign railway electrification, 527.

*Indicates illustrated articles

Mistake in numbering.
Pages 1197-1207 Skipped.